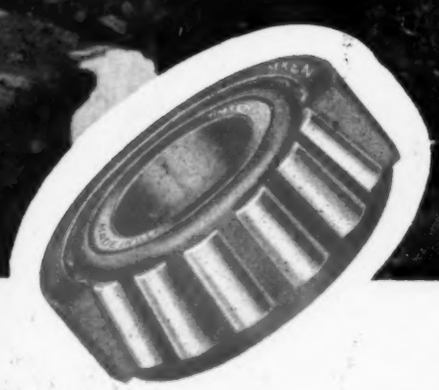
TECHNOLOGY DEPT.

PUBLIC LIBRARY
A 3 1946
ROIT

ROADS AND STREETS

JANUARY 1946



Charleston-Kanawha Airport, Charleston, W. Va.

Moving 5,000,000 Cubic Yards of Dirt on TIMKEN BEARINGS

Every type of modern dirt-moving equipment is represented in this big airport construction project, comprising a fleet of "Caterpillar" Diesel Tractors with bulldozers, scrapers, wagons, tampers, rippers, sheepsfoot rollers and motor graders.

The job includes 5,000,000 cubic yards of excavation in some of the roughest terrain east of the Rockies and the laying of 3 blacktop runways 5000 and 6000 feet long and 150 feet wide.

All of the tractors and most of the other machines are equipped with Timken Tapered Roller Bearings. The entire construction industry is Timken Bearing conscious. Engineers, contractors and equipment manufacturers know these bearings improve performance; increase endurance; reduce maintenance; and cut costs.

To be sure of getting tapered roller bearing benefits in full, make sure the trade-mark "TIMKEN" is stamped on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

R v.89 Jan.-June 1946

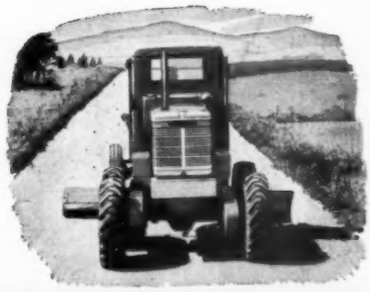
DITCHING

BANK CUTTING

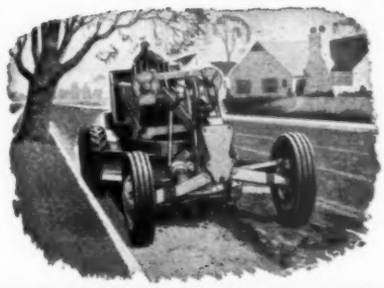
SURFACE MIXING

ADAMS

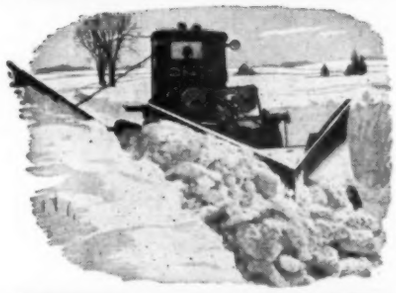
The All-Around Grader for Year-Around Service



ROAD and STREET MAINTENANCE



SCARIFYING



SNOW REMOVAL

WHEN YOU BUY an Adams Motor Grader, you buy a real *all-purpose, all-year* machine—a machine designed and built to deliver fast, efficient, economical service . . . *in all seasons* and *all weather.*

Big and husky, Adams Motor Graders have the power, traction and flotation to tackle any job within the range of a motor grader—plus the advantage of fast, power-operated cab controls that accurately position the blade for all types of surface, ditch and bank work—quickly, easily.

But this only begins to tell the story of Adams exceptional versatility. Eight overlapping forward speeds enable operators to obtain and maintain fastest practical working speeds on every type of operation. In addition to the road operations pictured here, Adams Motor Graders are adapted to a wide variety of work on—streets and alleys—airports—irrigation ditches—dam construction—and other grading projects.

Investigate the many all-around, year-around superiorities of Adams Motor Graders. See your local Adams dealer.

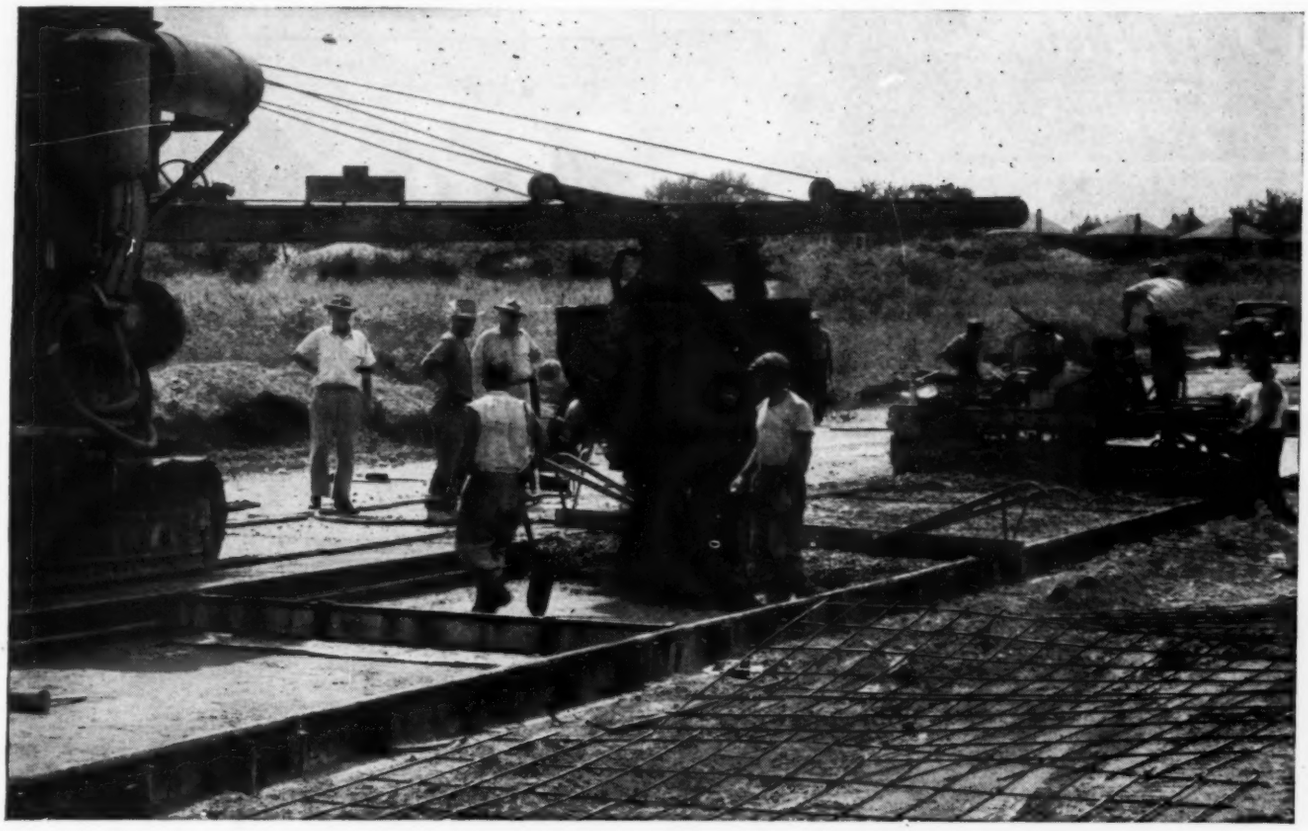
J. D. ADAMS MANUFACTURING COMPANY • INDIANAPOLIS, INDIANA

Adams

ROAD-BUILDING AND EARTH-MOVING EQUIPMENT

Tech

Build the Road Better



with Bethlehem Steels

You can build a concrete highway better by using Bethlehem's complete line of road steel products—because they're rugged, efficient, economical. And because there are real dollar-and-sense advantages in buying all your steel needs from one reliable source.

Bethlehem can give you co-ordinated service all along the line—from the time the Bethlehem hollow drill starts the job moving, until the last guard rail is set in place. By taking advantage of this service, you'll get your order under way fast, simply by contacting a Bethlehem representative—and you'll save yourself time, trouble and extra bookkeeping. Shipments will be scheduled to reach the job as needed, so that you'll avoid delays and idle equipment and men.

Get in touch with the nearest Bethlehem district office—or write to Bethlehem Steel Company, Bethlehem, Pa.—for full information about Bethlehem road steel products and service. No obligation, of course.

BETHLEHEM PRODUCTS FOR HIGHWAYS

Road Joints • Center Strip • Dowels Dowel Bar Supports • Reinforcing Bars Bar Mats • Bar Ties • Reinforcing for Concrete Pipe • Bridge Floor Reinforcing Concrete Slab Spacers • Welded Wire Fabric Guard Rails • Guard Posts and Brackets Wire Rope and Strand • Right-of-Way Fence and Posts • Anchor Rods • Pipe Hollow Drill Steel • Digging Bars • Structural Steel • Mold Boards • Corrugated Sheets • Turnbuckles • Tie Rods, Spikes, Bolts and Nuts • Timber Bridge Hardware Sheet and H-Bearing Piling

★ BETHLEHEM STEEL ★

PERFECTION

Gives you BALANCED Power Thrust

In Perfection scientifically engineered construction, the power thrust from the hoist is applied directly to the two longitudinal sills of the body understructure, which in turn evenly transmit the lifting power to ALL cross-members. This results in the full area of the bottom--from side to side and end to end--receiving a uniform thrust of power.

Since most pay-loads are not perfectly distributed--the weight usually being greater at one side or end--Perfection's BALANCED power thrust construction offers a distinct advantage over ordinary construction by reducing shock, strain, and wear.

Perfection Dump Bodies are available in many styles to suit special needs, and are designed to mount on any make or model chassis.

WITH THE CUSHION DROP MECHANISM

Write for names of nearest Distributors.

THE PERFECTION STEEL BODY COMPANY
GALION, OHIO

PERFECTION
TRUCK BODIES AND HOISTS

ROADS AND STREETS

Vol. 89 JANUARY, 1946 No. 1

In this Issue

Soil Compaction Conference 67

Editorials 70

9½ Million Yd. Airport Job, Second Year 71
By Harold J. McKeever, Editor, "Roads and Streets"

Picture of the Month 74

Rebuild Engineering Manpower! 77
By Charles M. Upham, Engineer-Director, ARBA

Job and Equipment Ideas 80

New Jersey Adopts Improved Approach Slab Design 82
By F. D. Woodruff, Asst. Superintendent of Maintenance, New Jersey State Highway Department

Special Trenching Rig for Beveled Ditch 84
By C. R. Hanes, Ohio Dept. of Highways

Outline of Research in Kentucky 86
By L. E. Gregg, Assoc. Research Engineer Kentucky Dept. of Highways

Thanks, John Lewis 88
By Halbert P. Gillette

What Price Maintenance Cost Data 90
By E. L. Worthington, State Maintenance Engineer, W. Va.

Texas Roads Rebuilt with Soil-Asphalt 96

Back from Military Service 98

Michigan Experience with Under-Body Blades 101
By A. L. Burridge, Consulting Highway Engineer

Improving Engineer-Contractor Relationships 103
By H. K. Glidden, Eastern Editor, "Roads and Streets"

Construction Equipment Maintenance:

Larger Shop Space, This Contractor's Answer 107

How to Make Rope Splices 110

More Tire Advice 112

Postwar Parade of New Equipment and Materials 116

Manufacturers' Literature 125

With the Manufacturers and Distributors 127

Clearing House 132

A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

WITH ROADS AND STREETS HAVE BEEN COMBINED GOOD ROADS MAGAZINE AND ENGINEERING & CONTRACTING

HALBERT P. GILLETTE, President; EDWARD S. GILLETTE, Publisher; HAROLD J. McKEEVER, Editor; CHARLES T. MURRAY, Managing Editor; H. K. GLIDDEN, Eastern Editor (N. Y.); LT. COL. V. J. BROWN, Publishing Director (Absent on Military Duty); H. J. CONWAY, Advertising Editor; L. R. VICKERS, Promotional Director.

Published Monthly by Gillette Publishing Co., 330 South Wells St., Chicago, Ill.; New York office, 155 E. 44th St.; Cleveland office, Leader Bldg.; Los Angeles office, 816 W. 5th St. Acceptance under the Act of June 5, 1934, authorized January 25, 1938, at Chicago, Illinois. Subscription price $3.00 per year in the United States and Canada, $4.00 per year for foreign mailing.

YOU'LL GET *MORE* OUT OF A *MULTI-PURPOSE* LORAIN!

CAREFUL job analysis shows that the vast majority of construction operations can be broken down into the seven basic work classifications shown below. Since no one can tell exactly which of these types of work—or combinations of them—your present or next contract will bring, the wisest investment is in equipment that can be adapted to every kind of work. And no other machines will fit into any and all classifications as well as multi-purpose Lorain Cranes and Shovels!

When you plan your next equipment purchase, look beyond the immediate job—consider the long range possibilities of what you buy. In stamina, in basic engineering and adaptability to every kind of work, Lorain Cranes and Shovels are designed to give you *years* of service on *all kinds* of jobs.

The five convertible and interchangeable front-ends shown actually give you five machines in one—an all-purpose outfit ready to cover the entire range of excavating, material handling and building jobs.

Ask your nearest Lorain distributor—or write us direct —for the facts and figures. Among the large and small crawler-mounted Lorains, rubber-tired Lorain Moto-Cranes and rubber-tired Self-Propelled cranes there's the right machine for your conditions. Let us help you pick the right one now for many future years of profitable service.

You can do all these jobs with one machine —A LORAIN!

Easily and quickly convertible to dragline, clamshell, shovel, backdigger or crane work, one Lorain will give you the same work range as several special purpose machines! Available on crawler or rubber-tired mountings.

Reg. Trade Mark

thew-Lorain

THE
THEW SHOVEL CO.
Lorain, Ohio

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

YOUR GUARD AGAINST ACCIDENTS

KEYSTONE *SNOW PLOW* LIGHTS

These specially designed lights are doing their part in preventing accidents in snow plowing operations all over the country, engineered and manufactured for rough, bad weather usage. Vibration proof, water proof—will operate under most difficult weather conditions. Universally used in snow plowing.

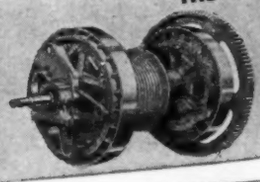
AUTO GEAR & PARTS COMPANY

HUNTING PARK AVE., ROOSEVELT BLVD., & 16th ST.,
PHILADELPHIA 40, PA.

Are you getting these advantages in the NEW SHOVELS CRANES and DRAGLINES you are ordering?

THE "FEATHER-TOUCH" CLUTCH CONTROL— for easy operation that keeps the high output curve up all day long.

THE CUSHION CLUTCH— assures longer cable life and reduces strains on all parts under power when overloads come on.



THE HELICAL GEAR DRIVE— smooth, quiet, nothing to stretch—the highest possible type of speed reducer.

THE UNIFORM PRESSURE SWING CLUTCH— takes the jerks and grabs out of swinging—means longer life—fewer adjustments—no inside or outside band clutch can be a uniform pressure clutch.

THE NORTHWEST DUAL INDEPENDENT CROWD— an independent Crowd plus an additional force for crowding that other shovels waste—handles harder digging and more yards per hour.

NORTHWEST CRAWLER— no pockets to pack dirt in under rollers, gears fully enclosed. Differential steering on all machines 1 yd. capacity and larger.

BALL OR ROLLER BEARINGS— on all high speed shafts—maximum transmission of engine power to all operations.

AND MANY OTHER NORTHWEST FEATURES

If you are buying a Northwest, of course, you are—these advantages and many more. If you are planning on the purchase of a shovel, crane, dragline or pull-shovel, go into it deeply. You'll want these features and the many other features that Northwest can bring you.

Check the companies that now own Northwests. Note how many of the nation's leading contractors practically standardize on Northwest. Note that every third Northwest sold is a repeat order—the best possible testimonial to service.

Northwests are money makers, with a long record for high output and low maintenance. Northwests bring you the kind of service you are looking for.

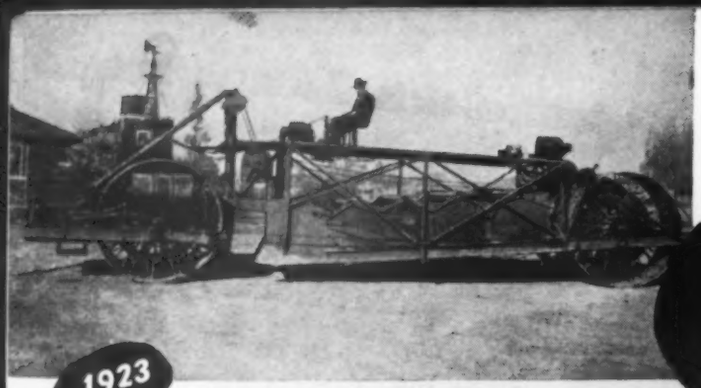
NORTHWEST ENGINEERING CO.
1732 Steger Bldg. · 28 E. Jackson Blvd.
Chicago 4, Illinois

EVERY THIRD NORTHWEST SOLD IS A REPEAT ORDER

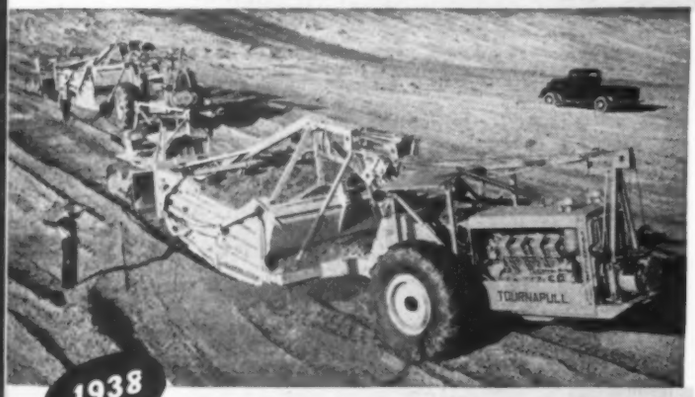
NORTHWEST

SHOVELS • • CRANES • • DRAGLINES • • PULLSHOVELS

TOURNAPULLS GIVE YOU



1923 First self-propelled, electrically-controlled Scraper, forerunner of today's Tournapull.



1938 Basic Tournapull design was proved on 13,000,000-yard Hansen Dam, Calif., where Guy F. Atkinson Co. used 13 of these 30-yard Tournapulls.

1940 Smaller 11-yard rig extended Tournapull profits to average-size construction jobs. On this 300,000-yard Washington Highway contract, Elliott & Co., Inc., moved dirt faster and at lower cost with 4 Tournapulls.

1946 The combined manufacturing and job experience of 4000 rigs is incorporated into today's 15-yard Tournapull — since 1941 delivering lowest-net-cost-per-yard. On this railroad contract, near Bensenville, Ill., Raemisch-Madden & McQueen, working on a 60-day time limit, used 12 Tournapulls, completed the 600,000-yard job in 48 working days, despite 18 days of rain in first month.

YOU CAN'T BUY IN ANY OTHER HIGH-SPEED SCRAPER UNITS

LeTourneau originated, pioneered and developed the modern high-speed rubber-tired prime movers and scrapers that have revolutionized the dirtmoving business. Through 8 years of on-the-job experience accompanied by continual improvement, over 4000 of these Tournapull units have been built and shipped, providing a background of field testing and performance records, plus basic and supplementary patents, shared by no other manufacturer. The Carryall Scraper and Power Control Unit used with the Tournapull have been perfected over 17 years and have been voted tops by dirtmovers who have bought 24,300 Carryalls and 68,000 LeTourneau Power Control Units.

TOURNAPULLS LEAD RUBBER-TIRED TREND

This unequalled world-wide experience under every test of climate, weather, application, materials

LETOURNEAU PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

JOB-PROVED Over 4000 Built and Shipped

TOURNAPULLS

Trade Mark Reg. U. S. Pat. Off.

Job Experience

and abuse has led to a realistic evaluation of every detail of a basic idea which has proved so fundamentally right that it has now become accepted as the most economical method of moving scraper dirt. Its success has started other manufacturers in this field on the trend to rubber-tired prime movers.

You know this background and also the LeTourneau policy of continual development of dirtmoving equipment and release of improvements as soon as field tests have proved their ability to increase production or lower costs. When you buy Tournapulls you can be sure they will give you lowest unit costs and the biggest profit opportunity of any scraper units available.

GET THE FACTS

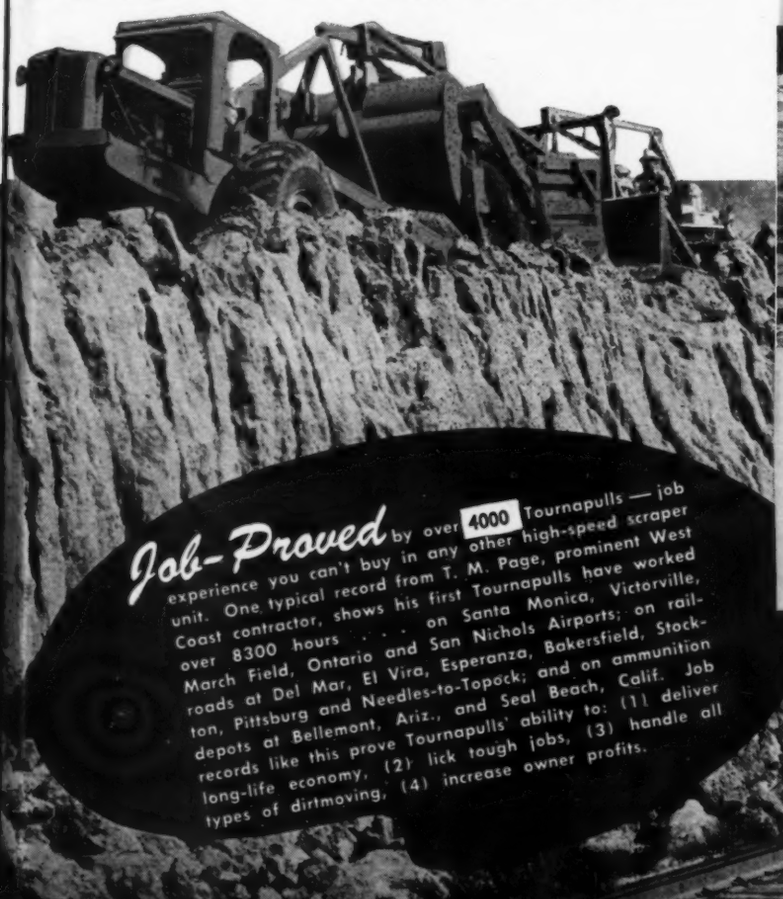
Look to LeTourneau now, as always, for leadership in development of dirtmoving equipment that will continue to give you lowest net cost per yard. Keep in touch with your LeTourneau distributor for advance information on Tournapull deliveries. Get his help in planning and estimating your jobs. He has experience and job-proved data that will help you. See him TODAY.

2-WHEEL DESIGN of Tournapull eliminates extra traction-robbing steering wheels. You pull and steer with drive wheels . . . turn faster and sharper . . . "lever" loads up stiff grades or through toughest hauling. Full prime-mover weight, plus 40% of Scraper and load, is concentrated on drive wheels . . . gives you greater traction to pull through loose sand, over bumps, in and out of mud holes. These Tournapull advantages helped lick this tough emergency Illinois River flood-control levee job.

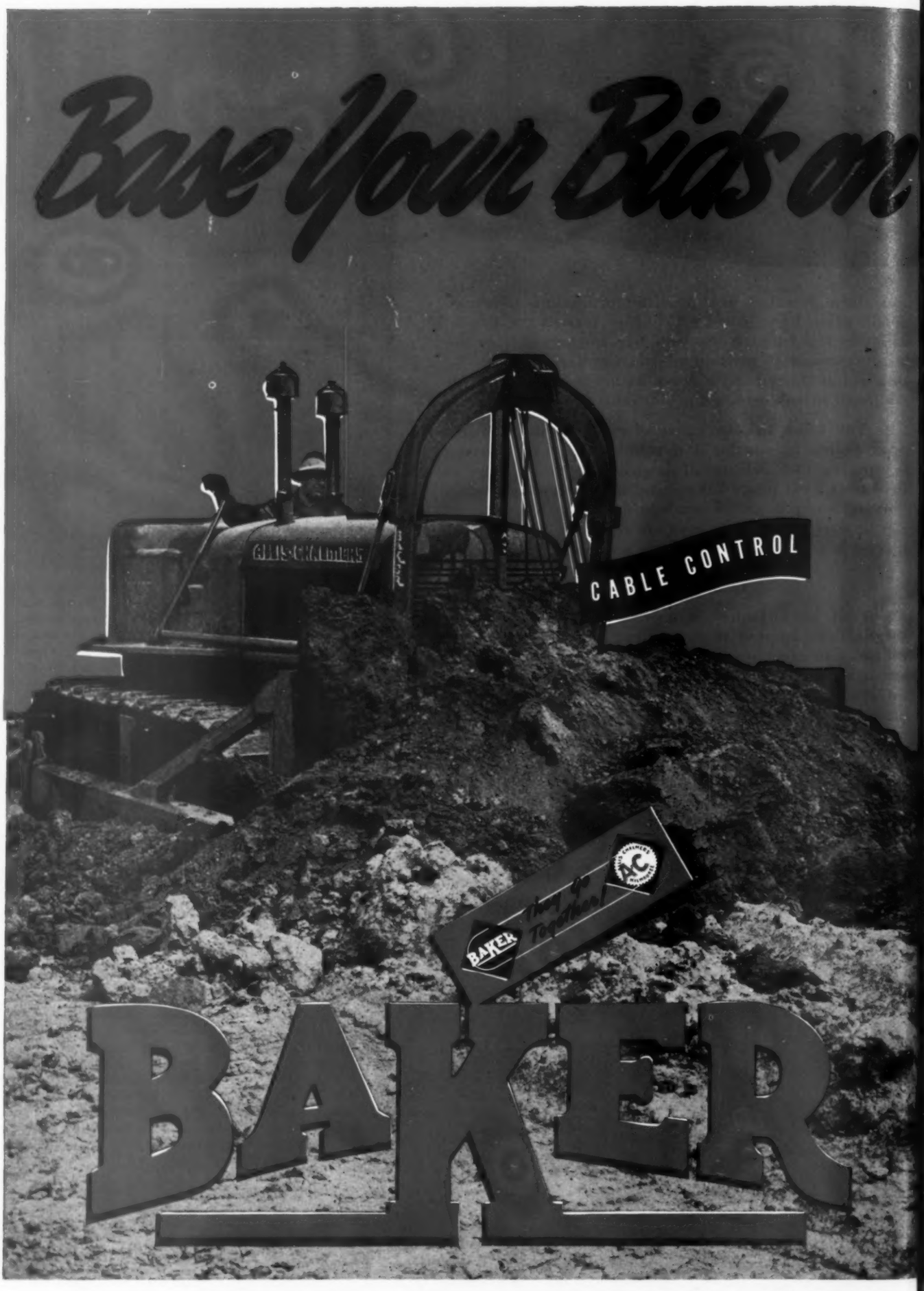
LESS WEIGHT PER H.P. enables you to carry pay load instead of equipment deadweight. The 150 h.p. Tournapull weighs only 31,000 lbs. That's 207 pounds of equipment per h.p. Compare this ratio with any other high-speed, rubber-tired scraper units. You'll find Tournapulls give you 30% more h.p. per pound of weight to move 15 heaped-yard loads on the level, up steeper grades and through tougher going. Successful contractors like A. I. Savin use Tournapulls to move extra pay yards each trip. On Rentschler Airport, E. Hartford, Conn., 5 of these rigs each averaged 55 heaping loads in 10 hours on 1.8-mile round trips.

HIGH AVERAGE SPEED is more important than high-rated m.p.h. A self-propelled scraper can seldom use extremely fast hauling speed. Its performance economy depends rather on a faster all-around cycle of load, haul, spread and return. Tournapulls' extra power with less weight . . . plus proper gear ratios . . . give you faster acceleration to get into high gear quicker . . . stay in high gear longer. Result — *higher average speed*, shorter cycle time, more yards per hour. Working in heavy, wet gravel at Bellows Falls, Vt., contractor Frank Whitcomb's Tournapull gets away from pusher faster, quickly hits 14.9 mph.

C33X



Job-Proved by over **4000** Tournapulls — job experience you can't buy in any other high-speed scraper unit. One typical record from T. M. Page, prominent West Coast contractor, shows his first Tournapulls have worked over 8300 hours . . . on Santa Monica, Victorville, March Field, Ontario and San Nichols Airports; on railroads at Del Mar, El Vira, Esperanza, Bakersfield, Stockton, Pittsburg and Needles-to-Topock; and on ammunition depots at Bellemont, Ariz., and Seal Beach, Calif. Job records like this prove Tournapulls' ability to: (1) deliver long-life economy, (2) lick tough jobs, (3) handle all types of dirtmoving, (4) increase owner profits.

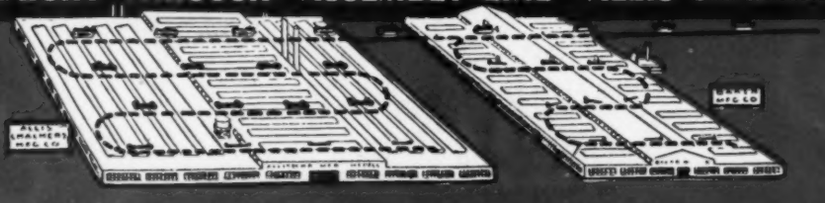

Base Your Bids on
CABLE CONTROL
BAKER
Hang Together
BAKER

Baker Bulldozers

Yes, successful bidders today, as before, know that when it comes to turning out yardage it's Baker every time. Hard hitting, powerful, dependable—teamed with Allis-Chalmers Diesel tractors, they set the pace on any job. Baker 'dozers are built exclusively for A-C tractors—cooperatively engineered, designed, tested and produced by two great leaders in their respective fields. That is why there is no compromise in design—no unbalanced performance—no adaptations required. That is why there are more Baker 'dozers on Allis-Chalmers tractors than all other makes combined

THE BAKER MFG. CO., SPRINGFIELD, ILLINOIS

"STRAIGHT THROUGH" ASSEMBLY LINE – ALLIS-CHALMERS TO BAKER TO YOU!

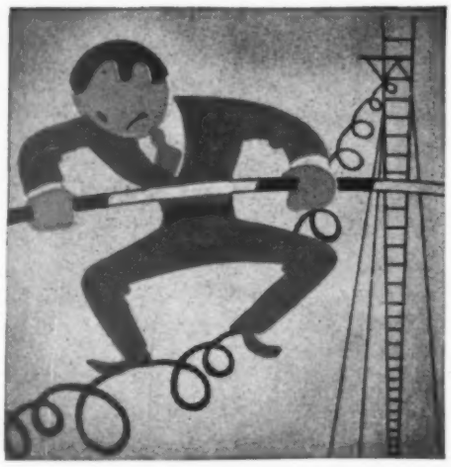


The modern Baker plant with its completely equipped fabricating, machining and blacksmithing shops adjoins the Allis-Chalmers crawler tractor plant. When you order an A-C tractor with Baker bulldozer or gradebuilder, your tractor leaves the A-C assembly line, crosses a narrow court and goes on the Baker final assembly line.

For Money In Your Pocket
PERFORMANCE . .

Resists Kinking

Being free from internal stress, it is always easy to handle—never fights back.



Spools Better

Even with a light load, it spools uniformly—is never cranky.

Takes Reverse Bends

Takes this "fatigue" much better, as on rope-ruining elevator installations.

Safer to Handle

Worn union-formed ropes handle as safely as new, as broken outer wires lie close to rope.

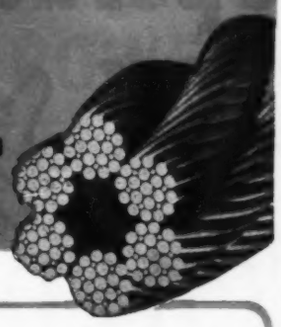
Always Relaxed

While it is flexible, and pliant, it has the "toughness" to withstand strain and weight.

Behaves on Grooves

Resists rotating or twisting in sheave grooves because wires are Preformed.

. . . Specify



union-formed

(preformed)

THE ULTIMATE IN LOW COST WIRE ROPE

Precision Constructed to OUTPERFORM *ordinary Wire Rope*

FIGHT! FIGHT! There is an exhausting fight going on all the time in ordinary wire rope, Each wire is fighting constantly to get out of the fixed position into which it is forced without any preliminary training to put it in shape. This internal fighting spoils the performance, cuts it short, doesn't give you a run for your money.

In **union-formed** Wire Rope each wire is put in shape (*Pre*formed) before it ever touches another wire in the rope. The result is exactly the same that comes from a set of conditioned muscles, i. e. finer coordination, greater endurance, top-flight kind of performance that does not let you feel out-of-pocket.

Yes sir! You will always get the most out of the best. The little extra you invest for the best is the part of your investment which will bring the payoff—yield the most dividends. Prove this fact to your own satisfaction. *Specify* **union-formed**—get money-in-your-pocket performance.

union *Wire Rope*

UNION WIRE ROPE CORPORATION

2200 Manchester Avenue Kansas City 3, Missouri

Tulsa 3 Houston 11 Chicago 6 Salt Lake City 13 New Orleans 16

Monahans, Tex. Portland 10, Ore. Ashland, Ky. Atlanta 1

NEW CHALLENGE *Confronts Road Builders*

The first challenge came in 1919—first full year after first World War.

That year Americans en masse decided that the automobile was more than a pleasure vehicle—that it was a necessity—the means of transporting them to horizons of greater freedom.

That year we had 6 million automobiles—virtually no surfaced roads. Oregon passed the first gasoline tax law. The Federal Government paid out nearly 3 million dollars to help pay for state road systems.

All states acquired highway departments and passed gasoline tax laws. Planned road building got under way. Road builders met the challenge—got us out of the mud. In ten years we had 23 million motor cars—the life of Americans was transformed—became mobile.

Then, in a 7-year period more than a half billion dollars of state highway funds were diverted for such things as the dole—enough to build 20,000 miles of highway.

New construction was cut deeply. Stymied highway departments lost initiative. Shrunken road building organizations were further drained by the draft and war traffic took a terrific road toll.

But not until war stopped production, did people stop buying cars to boost the total to 33 million.

The first full year after World War II finds us with three-fourths of our roads alternatingly dust or mud, while in urban areas we're driving bumper to bumper at a pace not much faster than in the old horse and buggy days.

Up To Road Builders To Start One of Nation's Largest Industries On The Move Again

A half billion round Federal dollars are earmarked but can't roll into roads until State, County and Municipal plans are completed and legislative bodies vote matching funds.

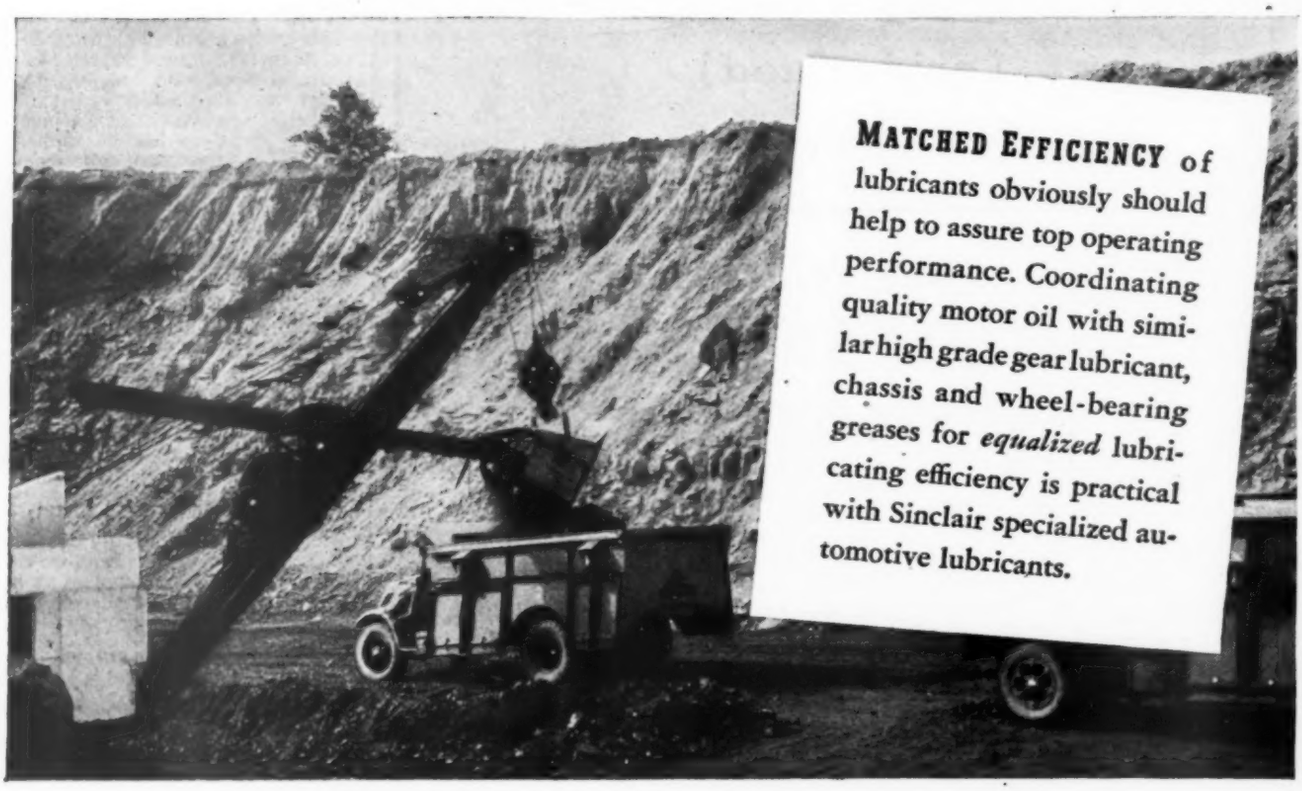
Every American has a stake in road building. A seventh of all workers have a big stake because their livelihood depends upon it.

All America now looks to State, County and Municipal highway and street departments to enlarge their professional organizations to speed up plans; to legislative bodies to provide undivertable revenue to match Federal funds; to the raw materials producers to expand output; to the makers of machinery for more and better equipment and to the road contractors to mobilize greater forces and efficient equipment.

This Is The Challenge of 1946. To meet it calls for the **Active Cooperation** of every profession and industry having a part in road building. Let's meet that challenge head on.

For Top Operating EFFICIENCY

MATCHED LUBRICANTS


MATCHED EFFICIENCY of lubricants obviously should help to assure top operating performance. Coordinating quality motor oil with similar high grade gear lubricant, chassis and wheel-bearing greases for *equalized* lubricating efficiency is practical with Sinclair specialized automotive lubricants.

SINCLAIR OPALINE* MOTOR OIL offers positive engine lubrication, free acting rings, resistance to carbon deposit and crankcase accumulations, avoidance of bearing corrosion . . . OPALINE GEAR LUBRICANT provides extreme pressure lubricating protection to prevent galling and scuffing, resists oxidation under operating temperatures, and is free flowing under Winter conditions . . . OPALINE CHASSIS LUBRICANT has "staying" properties and built-in extreme pressure characteristics . . . and for wheel bearings SINCOLUBE is designed to meet service temperature and pressure requirements, also keep an adequate lubricating film on balls and rollers, with freedom from leakage to brake linings and hubs.

• • •

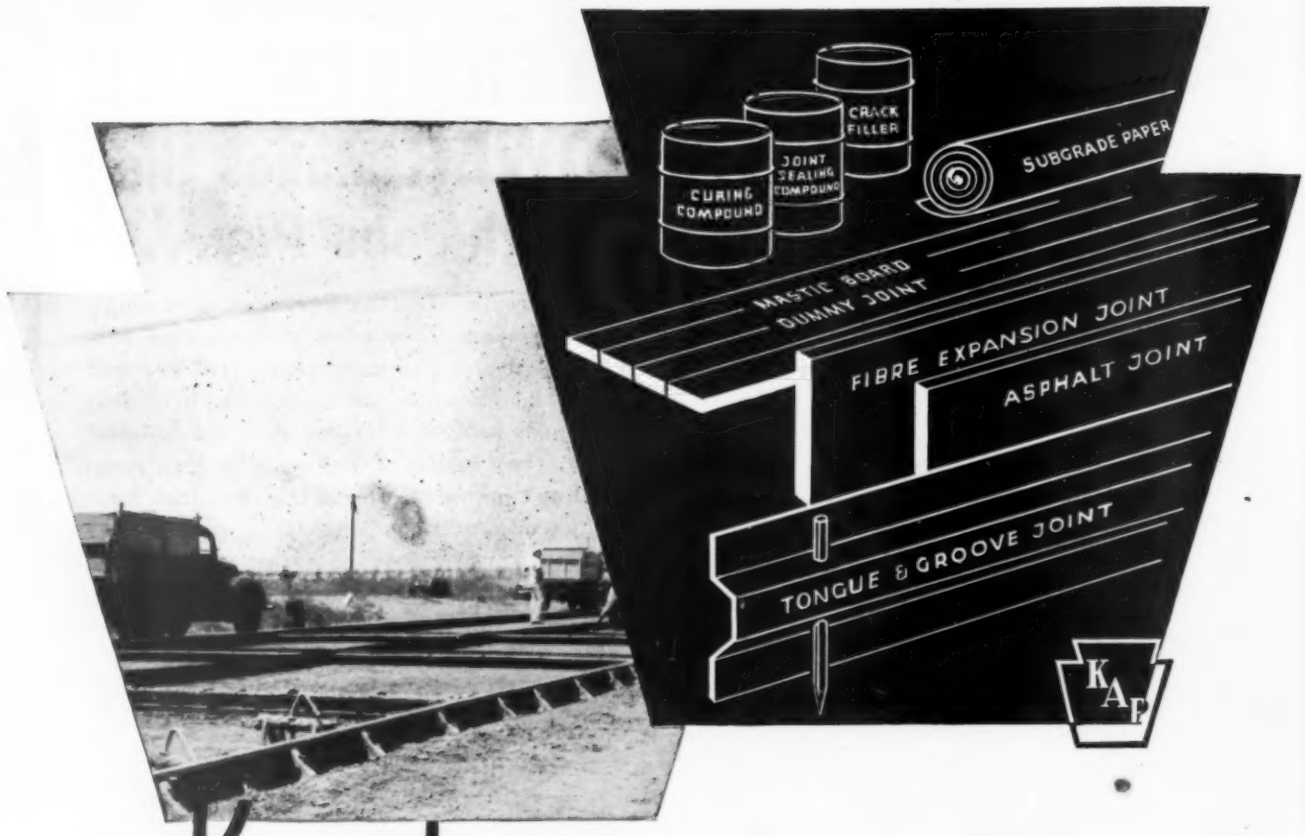
Try these matched lubricants for top operating efficiency and economy.

* Reg. U. S. Pat. Off.

SINCLAIR LUBRICANTS-FUELS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

INTERNATIONAL
POWER Makes the
Tough Jobs Pay...
● Let International TracTracTors tackle your tough earth-moving jobs. They offer you matchless performance, with unbeatable operating economy and minimum maintenance. Owners everywhere find Internationals profitable because they are designed to power a great variety of digging, lifting, carrying and hauling equipment at maximum capacities. Each International Crawler completely satisfies earth-moving, construction and excavating needs to which they are matched. Instant starting, *full Diesel* engines—of advanced design for great lugging ability—give Internationals the brute power required for this work.
See your International Industrial Power Distributor for TracTracTors, Wheel Tractors, Engines and allied equipment.
Industrial Power Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue
Chicago 1, Illinois
INTERNATIONAL
INTERNATIONAL HARVESTER
Industrial Power



Keystone PAVING PRODUCTS

make every concrete road job better

Cracked and crumbling concrete pavement is often due to obsolete and unnecessary construction methods. Keystone products and Keystone joint construction allows expansion and contraction and gives resilience to paving slabs never before achieved. Keystone products cut costs or prolong pavement life, or both. And Keystone supplies all your concrete paving needs except sand, gravel and cement. *All from one source.*

KEYSTONE TONGUE AND GROOVE JOINT—provides maximum load-bearing efficiency and longer paving life. Recommended for both longitudinal and transverse use.

KEYSTONE ASPHALT MASTIC BOARD DUMMY JOINTS—economically provide true alignment without expensive installing machinery. Waterproof, rigid, easy to handle, low in cost.

KAPCO CURING COMPOUND—an easily applied membrane type, transparent liquid. Retains maximum amount of mixing water. Adheres to wet surfaces. No discoloration . . . no slick surfaces.

OTHER "ROAD TESTED" KEYSTONE PRODUCTS—Asphalt Joint Sealing Compound, Kapco 336 Rubber Asphalt Joint Sealing Compound, Crack Fillers, Subgrade Papers, Sewer Pipe Joint Compounds, Fibre and Asphalt Expansion Joints, Cap Plates and Installation Channels, Waterproofings.

Send for free illustrated catalog, price list and details of Keystone's complete "one-source" service. Free paving plans and engineering advisory service included. Write today to Dept. 116.

Keystone ASPHALT PRODUCTS CO.

A DIVISION OF AMERICAN-MARIETTA COMPANY

GENERAL OFFICE: 43 EAST OHIO STREET, CHICAGO 11, ILLINOIS

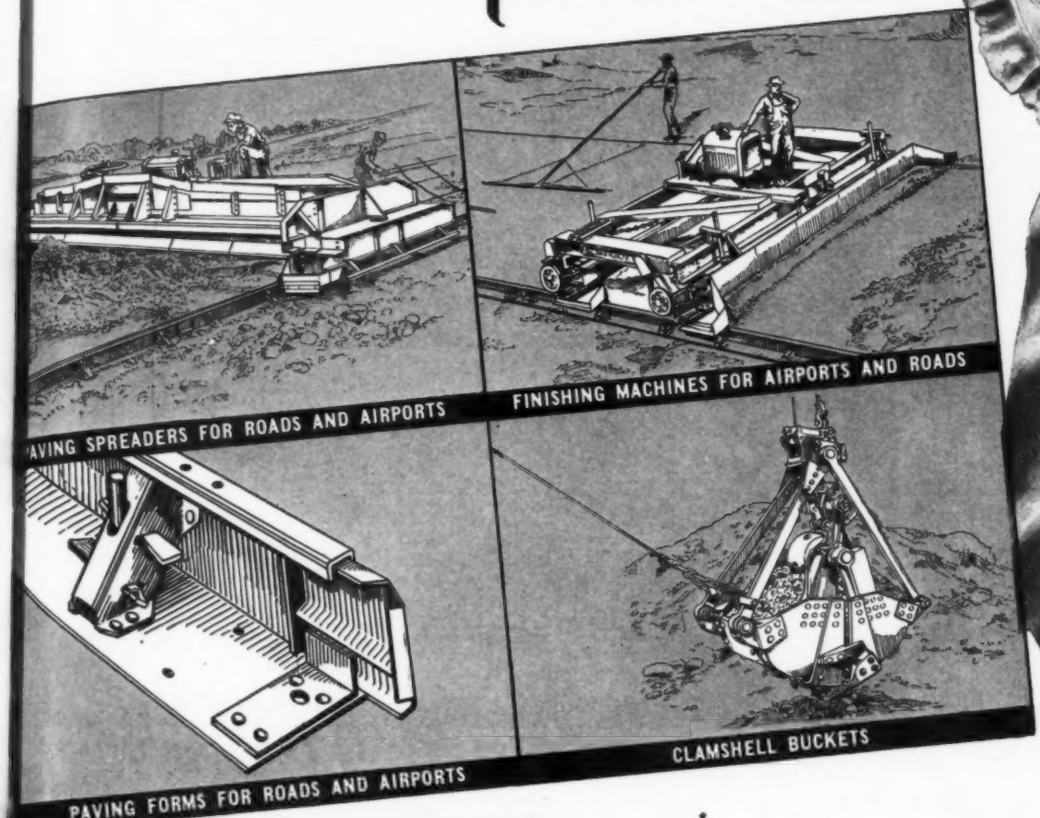
MANUFACTURING PLANT: CHICAGO HEIGHTS, ILLINOIS

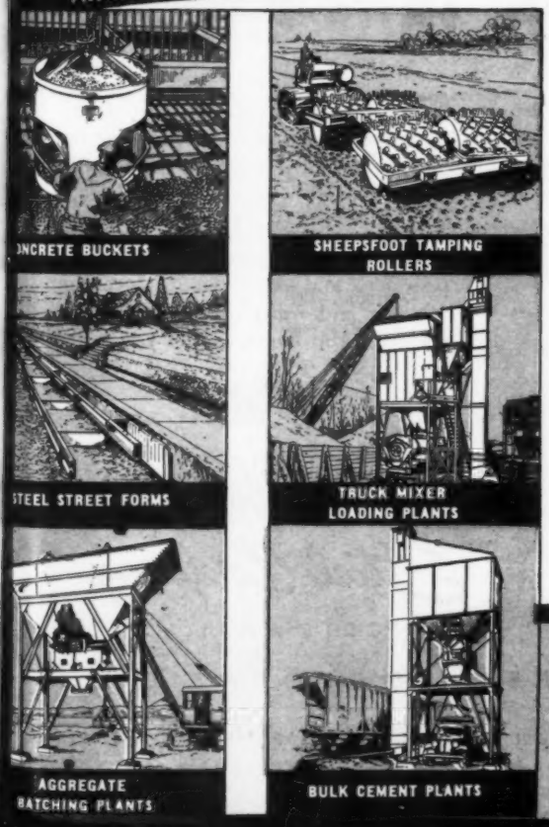
BLUE RIBBON PERFORMANCE MEANS

Record Smashing Production

High Quality Performance

Lower Costs and Greater Earnings


FINISHING MACHINES FOR AIRPORTS AND ROADS
AVING SPREADERS FOR ROADS AND AIRPORTS
CLAMSHELL BUCKETS
PAVING FORMS FOR ROADS AND AIRPORTS



Blaw-Knox Construction Equipment offers all three!

Where high speed construction is imperative, either to meet a tough schedule or to make up for unforeseen delays, you can bank on Blaw-Knox Equipment getting the job done quicker.

Where quality of work has to satisfy the requirements of rigid inspection, the Blaw-Knox equipped contractor can depend on his machinery.

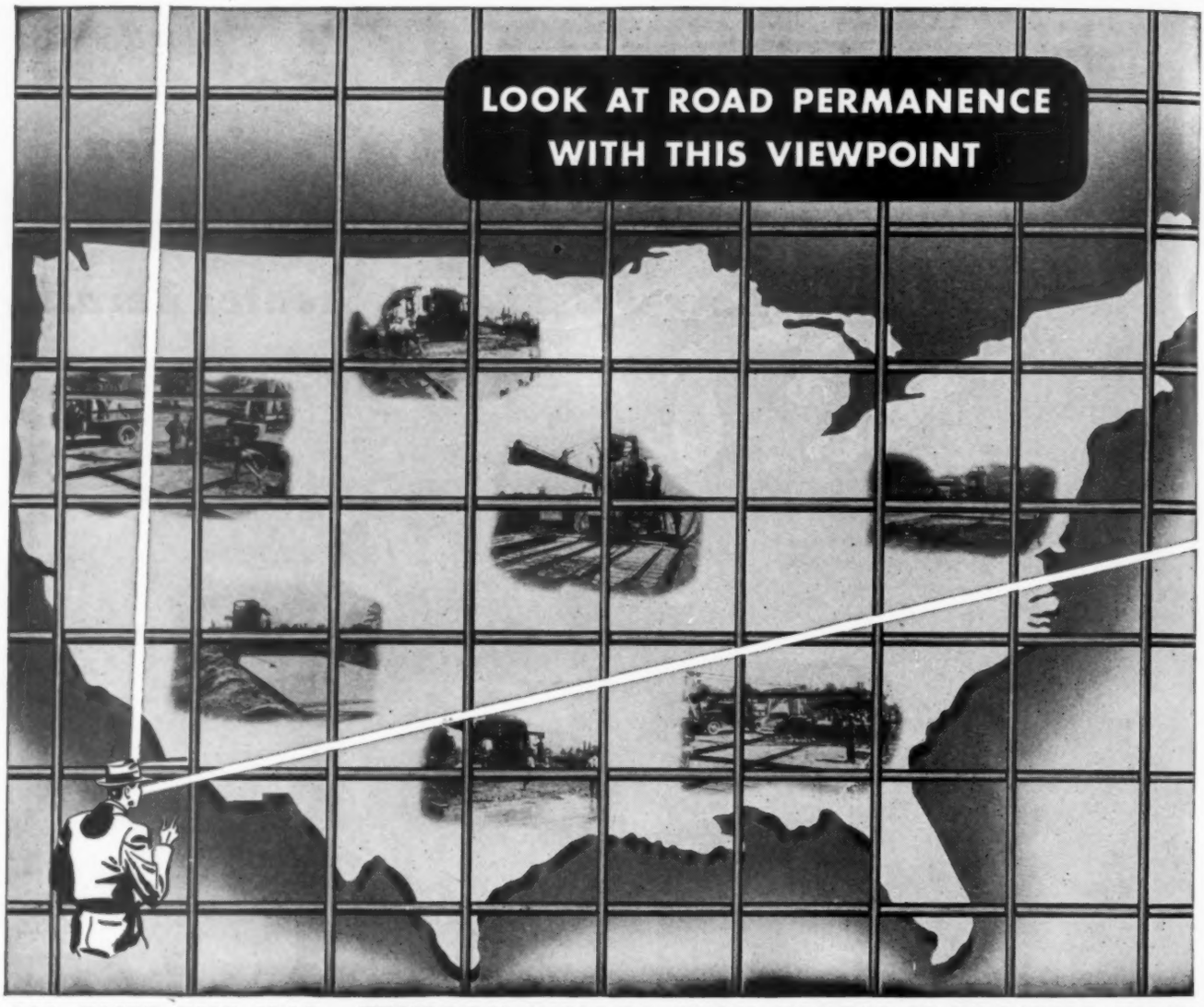
Earlier completion and high quality performance through the use of Blaw-Knox Construction Equipment mean cost reduction and larger profits.

The features you are looking for — the factors that mean **Blue Ribbon Performance** — are built into Blaw-Knox batchers and forms, buckets, spreaders and finishers, etc. Experience of our armed forces overseas, and of contractors everywhere, bears this out.

For details — photos — performance data, write for Bulletin No. 2036.

BLAW-KNOX DIVISION of Blaw-Knox Co.
2003 Farmers Bank Bldg. Pittsburgh 22, Pa.

BLAW-KNOX
CONSTRUCTION EQUIPMENT



ALL OVER THE MAP—TRUSCON WELDED STEEL FABRIC IS PROVING THAT

Steel Builds Roads that Endure!

Steel and concrete have proved their special worth in millions of miles of highways. At every point of the compass . . . under every conceivable condition of weather . . . Truscon Welded Steel Fabric Reinforcement, and other specialized Truscon roadbuilding products, are assuring long-life concrete pavements.

Engineers and designers have found by experience, practice and research that the following advantages can be expected from Truscon Welded Steel Fabric Reinforcement:

Provides resistance to cracking due to shrinkage of concrete during setting period.

Provides tensile strength necessary to resist subgrade friction caused by expansion and contraction of the concrete slab due to temperature changes.

Provides increased resistance to cracking of concrete due to warping under load.

Provides resistance to the development of microscopic cracks into visible cracks.

Provides resistance to cracks opening and allowing the entrance of water.

Provides resistance to broken ends of slabs separating at a crack.

Decreases spalling and progressive disintegration of the concrete.

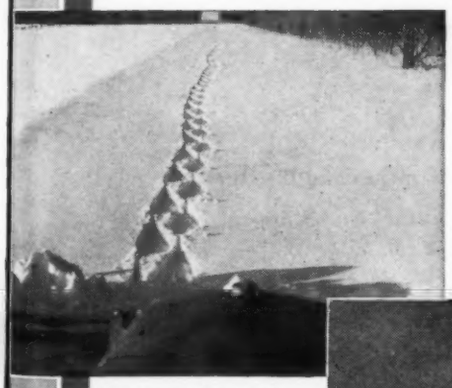
When you plan roads, plan them well. Use structural designs that have been proved the most economical, durable and serviceable in the *long run.* Use Truscon Welded Steel Fabric with other associated Truscon roadbuilding products, and assure lasting prestige for you and more permanent highways for the communities you serve.

TRUSCON
Steel Company
YOUNGSTOWN 1, OHIO

SUBSIDIARY OF REPUBLIC STEEL CORPORATION

ACTION REPORT

from the Snow-fighting Front!



Wind, sweeping across highway, packed snow five feet deep so hard men walking on it, sank less than a foot.

FWD plowed steadily forward . . . snow came out of cut in 3-foot square blocks, piled 10 feet high, later "winged" far out of way at high speed.

"The Setting": In the heart of the snow-belt on U. S. Highway 28, along the shores of Lake Superior, blocked by 3½ to 8-ft. grainy, crystallized "sugar snow" that "couldn't be plowed" (said some old-timers). **The Snow-Plow Truck:** An M-10 FWD. **The Action:** The FWD plunged in with its terrific snow-bank-busting power, cleared the final 14 toughest miles of snowbound highway in 6½ hours . . . opening a great section of forest land to vital lumbering operations! "Best equipment available for the job", concluded Highway Engineer Sharpensteen, directing the job.

Snow-fighting at high speed is just one of many highway jobs FWD trucks take in stride. During seasons other than winter, these trucks, with power and traction on all four wheels, are tops for road grading, heavy hauling, and scores of other heavy-duty road building and maintenance jobs. ONE truck for ALL jobs, ALL seasons . . . that's the FWD!

THE FOUR WHEEL DRIVE AUTO COMPANY
Clintonville, Wisconsin
Canadian Factory: Kitchener, Ontario

FWD TRUCKS

THE ORIGINAL EXCLUSIVE BUILDERS OF FOUR-WHEEL-DRIVE TRUCKS

MEET US IN CHICAGO
January 14-17
ARBA CONVENTION

DETROIT PUBLIC LIBRARY

CONCRETE FACTS

About Air-Entraining Cement

Atlas Duraplastic air-entraining portland cement is backed by eleven years of tests and research and seven years of successful field performance. It is specified by architects, engineers and contractors for paving, sidewalks, foundations, walls, gunite, and slip-form work.

SEVEN QUICK FACTS ABOUT DURAPLASTIC CEMENT

1. **Complies with** ASTM specifications and sells at same price as regular cement.
2. **Requires** less mixing water for a given slump.
3. **Makes concrete** more workable, more uniform, and more durable throughout.
4. **Minimizes** segregation and bleeding.
5. **Produces** concrete that spreads, screeds and finishes more easily.
6. **Fortifies** the concrete against the effects of freezing and thawing weather.
7. **Renders** paving concrete highly resistant to scaling due to action of de-icing salts.

For further information, write Universal Atlas Cement Company, (United States Steel Corporation Subsidiary) Chrysler Building, New York 17, N. Y.

OFFICES: New York, Chicago, Albany, Boston, Philadelphia, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

Atlas DURAPLASTIC Cement

TRADE MARK REG. U. A. C. CO.

A Universal Atlas Product

RS-D-26

SUNDAY EVENINGS—*American Broadcasting Company (Blue) Network—U. S. Steel's "The Theatre Guild on the Air"*

—Let the Record Speak!

Clark Bros.

SUBJECT: TORQUE CONVERTER TRACTOR
OWNER: CLARK BROS. CONSTRUCTION CO., Hinton, Iowa

PURCHASED JULY, 1941

AUGUST 20, 1943. Only a partial Overhaul after 6,100 HOURS OF OPERATION.

MARCH 24, 1945. First Complete Overhaul, after 14,000 HOURS OF OPERATION.

Owner's opinion at this time--"The Torque Converter is wonderful. It's easy on the tractor--operation is smooth, no jerking. Original master clutch is still on the tractor --in fact, we've never even taken up on the clutch!"

Said the owner then--"I am most pleased with the service record of the Allis-Chalmers Torque Converter Tractor. Besides, it has moved more yardage than any of my other tractors."

"NOT SO TIRED AFTER A DAY'S OPERATION"

Says Operator

Sioux City, Iowa
November 13, 1945

"I have operated this Allis-Chalmers HD-14C Tractor for over four years for Mr. Clark of the Clark Construction Company, Hinton, Iowa, and will say that the Torque Converter has it all over the gear type tractors. It has much smoother power and does more work. It is a lot easier to operate than the old tractor.

"I do not feel as tired at night after operating this tractor without all of that gear shifting."

Earl King, Operator

Operating the Gar Wood 515 cable scraper, Clark's Torque Converter tractor packs in bigger loads, moves them faster, smoother, with less operator effort . . . reduces maintenance cost of entire outfit.

Here's how the HD-14C Torque Converter tractor looks today . . . streamlined to the minute in appearance and performance.

CLARK BROS. was one of many to test the HD-14C, Torque Converter tractor. All were told to "give it the works." It has proved itself everywhere . . . OUTSERVICED, OUTPRODUCED conventional tractors under the most severe operating conditions. You can be sure you aren't experimenting when you put the Torque Converter tractor to work. It's a thoroughly TESTED, FINISHED PRODUCT . . . the tractor of the times! Get all the facts from your Allis-Chalmers dealer . . . NOW!

ALLIS-CHALMERS
TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

no wonder they call it A "PACKAGED BRIDGE"!

It's true—ARMCO MULTI PLATE is a "packaged" job. Here's why: The pre-curved corrugated metal plates nest together for quick, easy transportation to the job site. Local workmen bolt them together to fit the design. Only the simplest equipment and small tools are required. The MULTI PLATE "form" is the completed waterway. No slow curing, no wasted materials, no costly delays.

Detours are cut. Grading and other operations get the green light. You finish ahead of schedule and under the estimate, ready to move to another job.

Not only for bridges, but for large culverts, stream enclosures, sewers, conduits and underpasses, ARMCO MULTI PLATE is a time-saving, cost-cutting material. Write for descriptive bulletin. Armco Drainage & Metal Products, Inc., and Associated Companies, 85 Curtis Street, Middletown, Ohio.

Contractors like these "packaged" bridges because construction is speedy and simple. Delays to grading and other operations are reduced.

MULTI ARMCO PLATE

Armco Multi Plate

IT'S COMING!

Galion

THE NEW NO. 102 MOTOR GRADER

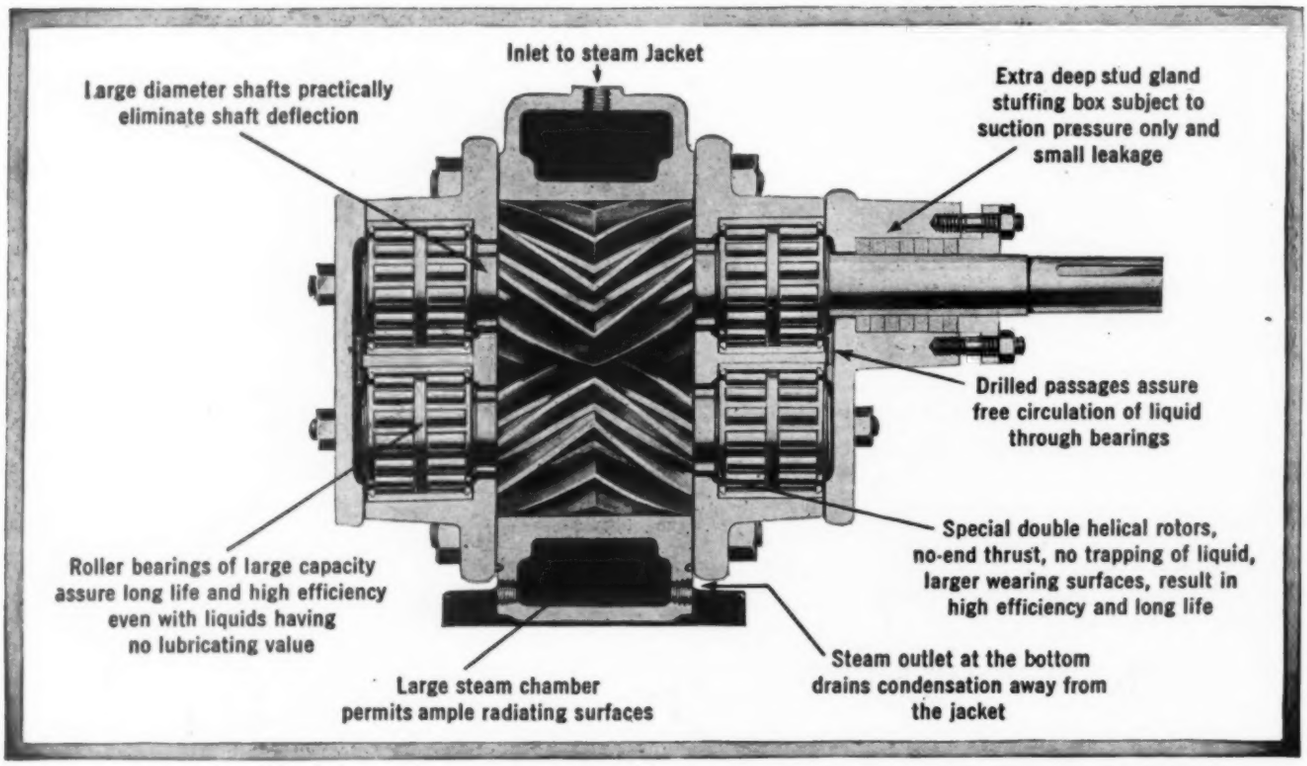
A new year is upon us. The picture has changed considerably during the past year. Having piled up an enviable war record, Galion enters 1946 with confidence . . . with a new line of motor graders and rollers. Bearing the well-known Galion name plate, these new models are worthy successors to our line of road machinery which has won so much confidence throughout the world. The Galion No. 102 motor grader, indicated above, is just one of the new heavy duty units to carry the Galion name, your guarantee of the best, in 1946.

The Galion Iron Works & Mfg. Co.

Main Office and Mills

Galion - - - - Ohio

HOW TO HANDLE ASPHALT WITHOUT GETTING "STUCK"


Inlet to steam Jacket
Large diameter shafts practically eliminate shaft deflection
Extra deep stud gland stuffing box subject to suction pressure only and small leakage
Drilled passages assure free circulation of liquid through bearings
Special double helical rotors, no-end thrust, no trapping of liquid, larger wearing surfaces, result in high efficiency and long life
Roller bearings of large capacity assure long life and high efficiency even with liquids having no lubricating value
Steam outlet at the bottom drains condensation away from the jacket
Large steam chamber permits ample radiating surfaces

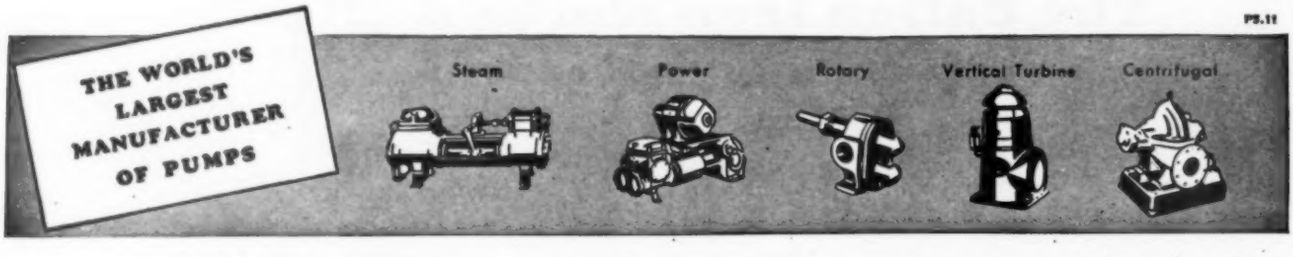
Specify Worthington GRJ Steam-Jacketed Rotary Pumps

Trouble-free handling is what you want in the pump you depend on for putting asphalt where you want it when you want it.

Fortunately, you can get dependability in a Worthington GRJ Steam-Jacketed Rotary Pump. The cross-sectional picture above shows you why. One thing the picture doesn't show, however, is the short starting time which results from the large radiating surfaces of the Worthington heating jacket. That means less time lost by equipment and men waiting for asphalt to flow.

Your nearby Worthington Representative can give you other valuable facts about Worthington GRJ Rotary Pumps. In the meanwhile, you can prove that *there's more worth in Worthington* by writing for Bulletin W487-B11. *Worthington Pump and Machinery Corporation, Harrison, New Jersey.*

WORTHINGTON



Here it is . . . The New . . .

MOTO-PAVER

Resurfacing a Michigan Road with the Moto-paver

An Entirely Self Contained, Self Propelled Asphalt Mixing and Laying Machine

Mixes, Spreads and Lays Any Type of Mixed-in-place Bituminous Material to Any Road Width, Thickness and Crown Condition.

Hetherington & Berner Inc., America's first builders of asphalt mixing machinery, proudly present the Moto-paver—the last word in asphalt mixing and laying equipment. This highly flexible and mobile machine is a complete traveling asphalt mixer and paver, requiring no separate loader, spreader or other paving equipment, and no trailer to haul it from one job to another. The Moto-paver is mounted on pneumatic tires, and powered by two gasoline engines, one driving the mixer and related units, the other driving the machine along the road. Paving speed is from 4 to 50 feet per minute, road speed 15 to 18 miles per hour. Mixing capacity is 100 to 120 tons per hour.

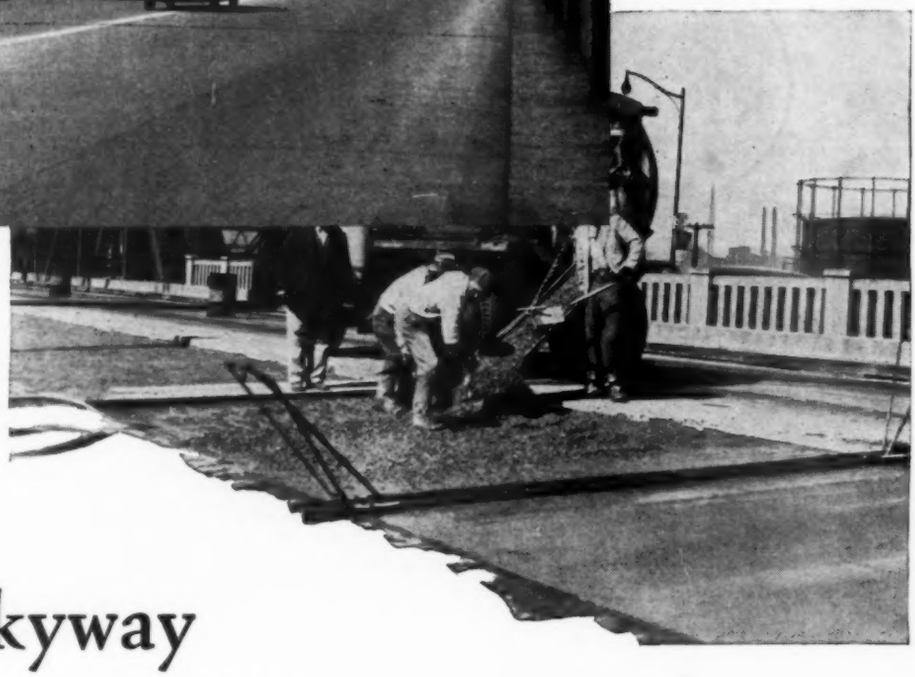
The Moto-paver mixes and lays all but the highest types of bituminous concrete. It is especially suitable for resurfacing trunk roads and streets of smaller municipalities, but it is also an efficient unit for new construction work on roads, streets, airports, parking lots, driveways, etc.

Write for bulletin MP-46, which gives complete information and specifications.

HETHERINGTON & BERNER INC. • 721 KENTUCKY AVE. • INDIANAPOLIS 7, IND.

Hetherington & Berner — *America's First Builders of Asphalt Mixing Machinery*

Concrete on New Jersey's Pulaski Skyway after 13 years of heavy traffic service.



Replacing 2,500 ft. section of Pulaski Skyway with concrete in 1945.

Pulaski Skyway carrying 60,000 cars per day *now all Concrete*

When the four-lane Pulaski Skyway was built in 1932, concrete pavement was placed on all but a 2,500 ft. section.

For 13 years the Skyway has carried from 40,000 to 60,000 vehicles per day. The concrete is still in excellent condition and has provided uninterrupted service at low cost for maintenance.

In 1945 it was necessary to repave the 2,500 ft. section. This has now been completed with concrete.

Besides concrete's demonstrated ability to carry a heavy volume of traffic at low cost for maintenance, concrete pavement usually costs less to build than any other pavement of equal load-carrying capacity.

Low first cost, low maintenance expense and long life, mean *low annual cost*—the reason why portland cement concrete is the most economical pavement for principal urban and rural highways and city streets.

Write for data on newest concrete pavement designs for roads, streets or airports. Free in United States and Canada.

PORTLAND CEMENT ASSOCIATION

Dept. 1-28, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of concrete . . . through scientific research and engineering field work

BODIES • LOAD PACKERS • REPAIR TOWERS • SWEEPERS • WINCHES • CRANES • TANKS • FLUSHERS • SPRINKLERS • ROAD MACHINERY • HOISTS
There IS a Reason
Gar Wood—World's Largest Manufacturer of Truck and Trailer equipment—earned this leadership through ability to engineer and build units of such outstanding performance that men who know equipment best specify Gar Wood.
BUY VICTORY BONDS
GAR WOOD INDUSTRIES, Inc.
DETROIT 11 MICHIGAN
GW
GAR WOOD INDUSTRIES, INC.
TRADE MARK

Other Products: HEATING UNITS • MOTOR BOATS

ROAD CONSTRUCTION AND MAINTENANCE EQUIPMENT

"SPRAY MASTER"

PRESSURE DISTRIBUTOR

"TANKAR" STEAM HEATER

Here is the Construction and Maintenance Equipment you have been waiting for—designed by engineers skilled and experienced in Black Top Construction and Maintenance requirements.

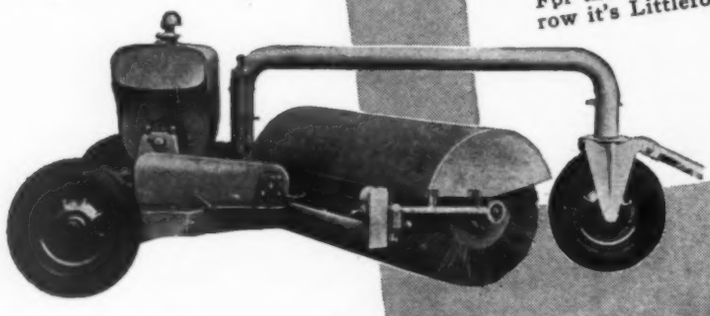
"Spray Master" Pressure Distributor has but one valve for operating the spray—has as standard equipment numerous features called extras on similar units.

"Tankar" Steam Heater is the fastest steam producing unit made today for unloading Tank Cars of Asphalt, etc.

Model No. 108 Power Driven Road Broom is a two-way broom capable of sweeping in either direction. Hydraulic Tention Control is a Littleford Feature.

For the best Black Top Units for today and tomorrow it's Littleford—make no mistake.

MODEL NO. 108 POWER DRIVEN ROAD BROOM



LITTLEFORD

LITTLEFORD BROS., Inc.

454 E. PEARL ST., CINCINNATI 2, OHIO

The Tougher the Job..

THE GREATER THE NEED FOR

Firestone

OFF-THE-HIGHWAY TIRES

THE cord bodies of the Firestone Rock Grip Excavator, the All Non-Skid Earth Mover and the Ground Grip Heavy Duty tires are made of highest quality rayon. The rayon plies are Gum-Dipped, a patented Firestone process, which increases their durability. Four additional tread plies cushion and absorb impact blows. Sidewalls are built double thick to protect against rutwear and snags. The tread rubber is extra tough—cut-resistant.

These facts explain the performance record of Firestone Off-the-Highway tires. You need tires that can take grueling punishment and stay on the job — minimizing time-consuming, costly delays. Put Firestone tires on your Off-the-Highway Equipment.

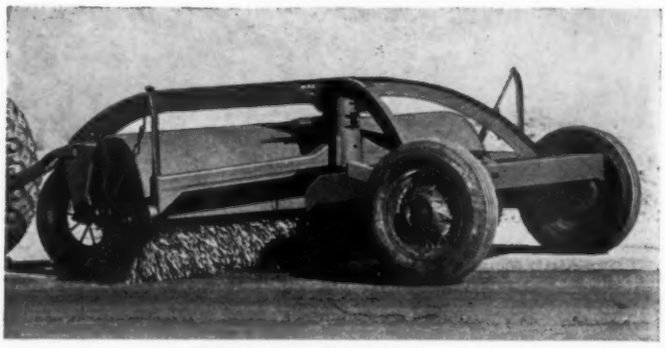
Listen to the "Voice of Firestone" every Monday evening

Copyright, 1946, The Firestone Tire & Rubber Co.

USE GRACE EQUIPMENT

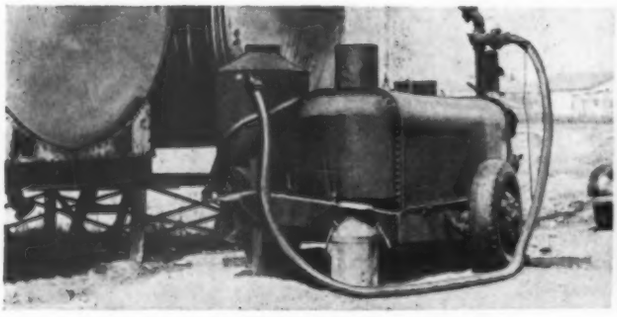
for postwar jobs

Pictured here are six pieces of Grace equipment that are designed to help you do your job quickly and economically in 1946. For full details on Grace equipment, write today. Shipments are made promptly.



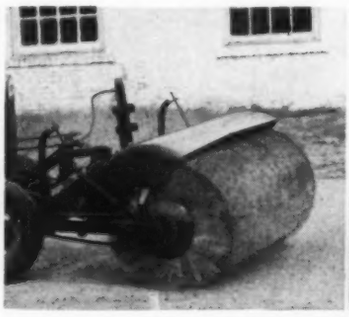
2-WAY AXLE DRIVEN SWEEPER

Grace is ready to help you on the big job ahead in 1946 with Sweepers built to fit your needs . . . cleaning road base prior to applying asphalt . . . sweeping streets . . . or for airfield construction work. The two-way axle-driven sweeper is easily adjustable, sweeps evenly and thoroughly.



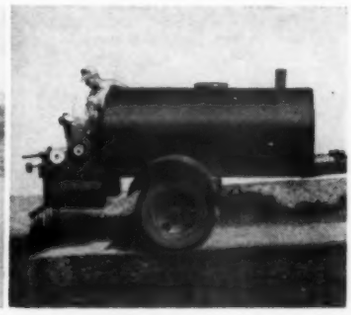
CIRCULATING TANK CAR HEATER

Another MUST for speedy and economical construction jobs. Flue construction provides positive circulating and prevents burning or overheating of asphalt. Pumps up to 250 GPM. Maintains temperatures up to 450°.



FRONT END SWEEPER

. . . sweeps either right or left. Has a minimum of working parts. Doesn't tie up side or rear power take-off of tractor.

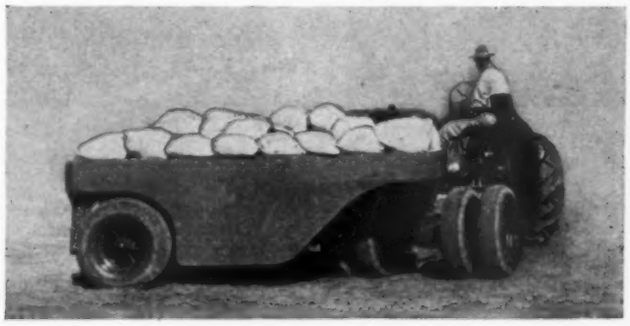


MAINTENANCE KETTLE

The Grace 600-gallon maintenance kettle is just the thing for quick patch work, widening shoulders, driveways, or leveling pavement.

SANITARY GARBAGE BODIES

New and improved to do a better job. Packing and ejecting mechanism means more pickups per trip . . . fewer trips to disposal area. Water-tight bottom prevents dripping. Non-tilting body.



PNEUMATIC ROLLER

Stablized surfaces are easily and smoothly compacted with the Grace Pneumatic Roller. Low center of gravity keeps load close to ground, eliminates tipping. Plenty of room for ballast. Constructed with 10 tires and oscillating axles.

W. E. GRACE MANUFACTURING COMPANY

6005 S. LAMAR STREET DALLAS, TEXAS

Cleveland Sinkers

PACK A MIGHTY WALLOP!

In addition to their remarkable power, Cleveland Sinkers are easily held and very economical in air consumption. Many sizes, in wet or dry collaring type, for fast drilling in every type of rock. Available with chucks for collared drill steel, and plain or lugged shanks. Drop forged construction insures super strength. End-seating valve (used on most models) improves with use, prevents greater air consumption as drill grows older. • Mountings available for Models H111 and H10 for conversion to drifter type drills, used on column arm or tripod. • Be sure to use these sinkers with the Cleveland Accessories shown here. *Remember, the most efficient rock drill delivers even better performance when equipped with the proper, high-quality accessories.*

Write for Bulletin 122 on Sinkers—Bulletin AC-11 on Accessories

Model H23, 83 lbs.
For extra tough drilling.

Model H111, 55 lbs.
An all around favorite.

Model H10.
Leader in the 45 lb. class.

Model H66, 32 lbs.
Light but powerful.

FOR BEST RESULTS USE
CLEVELAND ACCESSORIES

"Veribest" Air Hose is extra tough, withstands rough treatment.

Cleveland Air Filters prevent line trash from entering your drill.

Cleveland Line Oiler keeps drills amply lubricated and working at top speed.

Hose Clamp Tool is handy and efficient for securing wire clamps to hose and fittings.

Type "A" Couplings are made of a tough, rust-proof, bronze alloy. Quick-acting.

LEADERS IN DRILLING EQUIPMENT

CLEVELAND
ROCK DRILL DIVISION
THE CLEVELAND PNEUMATIC TOOL CO.
CABLE ADDRESS: "ROCKDRILL"
CLEVELAND 5, OHIO

BRANCH OFFICES

Birmingham 19, Ala.
Butte, Mont.
Dallas 1, Texas
Denver 2, Colo.
El Paso, Texas
Ironwood, Mich.
Lexington 19, Ky.
Los Angeles 11, Calif.
Newton Highlands 61, Mass.
New York 6, N. Y.
Pasadena 8, Calif.
Philadelphia 32, Pa.
Pittsburgh 22, Pa.
Salt Lake City 1, Utah
San Francisco 3, Calif.
St. Louis 3, Mo.
Wallace, Idaho
Washington 5, D. C.

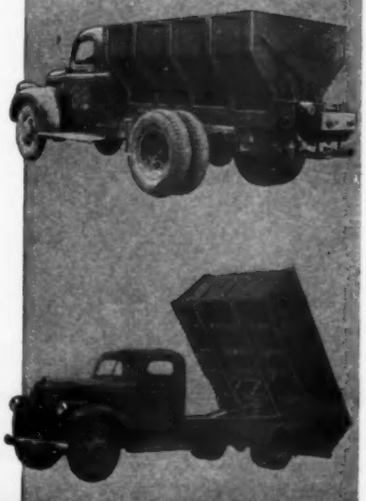
CANADIAN DISTRIBUTORS

Purves E. Ritchie & Son, Ltd., 658 Hornby Street, Vancouver, B. C.
Industrial Machinery Co., Ltd., 163 N. Water St., Halifax, Nova Scotia

Anthony HAS IT...

CONSTRUCTION EQUIPMENT THAT KEEPS TRUCKS ON THE MOVE

- *Anthony "Super" Hydraulic Hoists and Bodies,* up to 30 ton capacity—with "power speed lift" and "rubber restraining blocks", two of many features that explain the evident preference for Anthony equipment on the job.
- *Anthony Hydraulic Lift Gate* . . . one of the remarkable new war-developed pieces of equipment for loading and unloading. Raises and lowers loads from ground to truck level.
- *Anthony Material Spreader,* rugged, all steel; for road building, maintenance and ice control.
- *Anthony Hydraulic Platform "Booster" Hoists,* especially designed to make dump bodies out of flat bed trucks.



Write for complete details on any Anthony product. Available through all truck dealers and Anthony distributors.

ANTHONY HYDRAULIC

Manufactured by **ANTHONY CO.** Streator, Illinois

Simplicity...

ANOTHER IMPORTANT FACTOR OF EXCELLENCE IN

GEMMER STEERING

Gemmer Steering Gear design embodies that simplicity which is the essence of high quality design. There are only a few parts—nothing to get out of order or require frequent adjustment.

Such simplicity makes for exceptional sturdiness without excess weight or bulk—makes for compactness—makes for ease of installation. Weight saving is accomplished without sacrifice of overall capacity or steering arm angularity. Husky steel forgings provide abundant strength, durability—ample safety factor. Internal stresses are low.

Additional essential qualities contributing to the worth of Gemmer Steering are found in:

TEETH THAT ROLL—No sliding contacts between gear teeth. The hourglass worm bears on *teeth that roll*—providing highest efficiency—smooth, easy transfer of power.

STABILITY—Inherent design banishes "lost motion", and reduces wear to the least possible minimum. Steering is always firm, responsive, positive, with absence of rubbery feeling or wander.

ANTI-FRICTION BEARINGS—at all critical points—particularly important to efficiency where motion is relatively slow.

GEMMER STEERING demonstrated its worth in all types of peacetime automotive vehicles from lightest passenger cars to heaviest buses, trucks, roadbuilding machinery, and agricultural tractors. An equally commendable job is being accomplished on wide variety of vehicles and boats for our armed forces.

GEMMER—PIONEER OF HIGH EFFICIENCY STEERING

GEMMER

MANUFACTURING COMPANY

6400 MT. ELLIOTT AVE.
DETROIT 11, MICH.

Here's what CECO gives you for faster low-cost road building

ACCURATE PRE-BIDDING INFORMATION

Ceco takes the guesswork out of bidding by supplying accurate data, so you can bid to get the job . . . and make money on it, too.

BLUEPRINTS OF ENGINEERING DETAILS

Ceco engineers do the detail work for you in supplying all engineering data on reinforcing and other materials for the job.

ONE ORDER DOES IT ALL

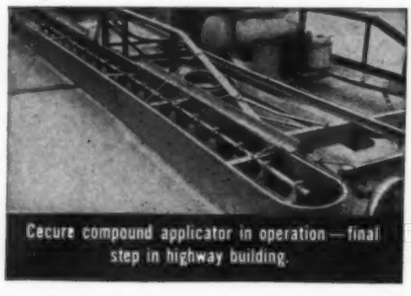
Ceco streamlines roadbuilding. In one complete order you can specify everything you need. Material is delivered as wanted and on time.

Metal center strip in place; dowel bars supported and ready for support; expansion joint in position.

22 CECO OFFICES AT YOUR SERVICE

There is a nationwide network of Ceco offices to serve you. So when you specify Ceco Highway Products, you know you get fast, dependable delivery from the nearest convenient warehouse . . . and always there's a Ceco engineer watching every detail . . . saving you time and money. Yes, here's highway service that's everywhere at once.

Placing the welded wire fabric, illustrating ease of handling.



Cecure compound applicator in operation — final step in highway building.

Investigate Ceco Cecure Curing Method

Ceco's new Cecure applicator offers these advantages:

1. **Gives positive application of Cecure curing compound.**
2. **Works 20 times faster than old style method.**
3. **Provides uniform curing — reducing danger of cracking.**
4. **One operation does the job.**

CECO STEEL PRODUCTS CORPORATION

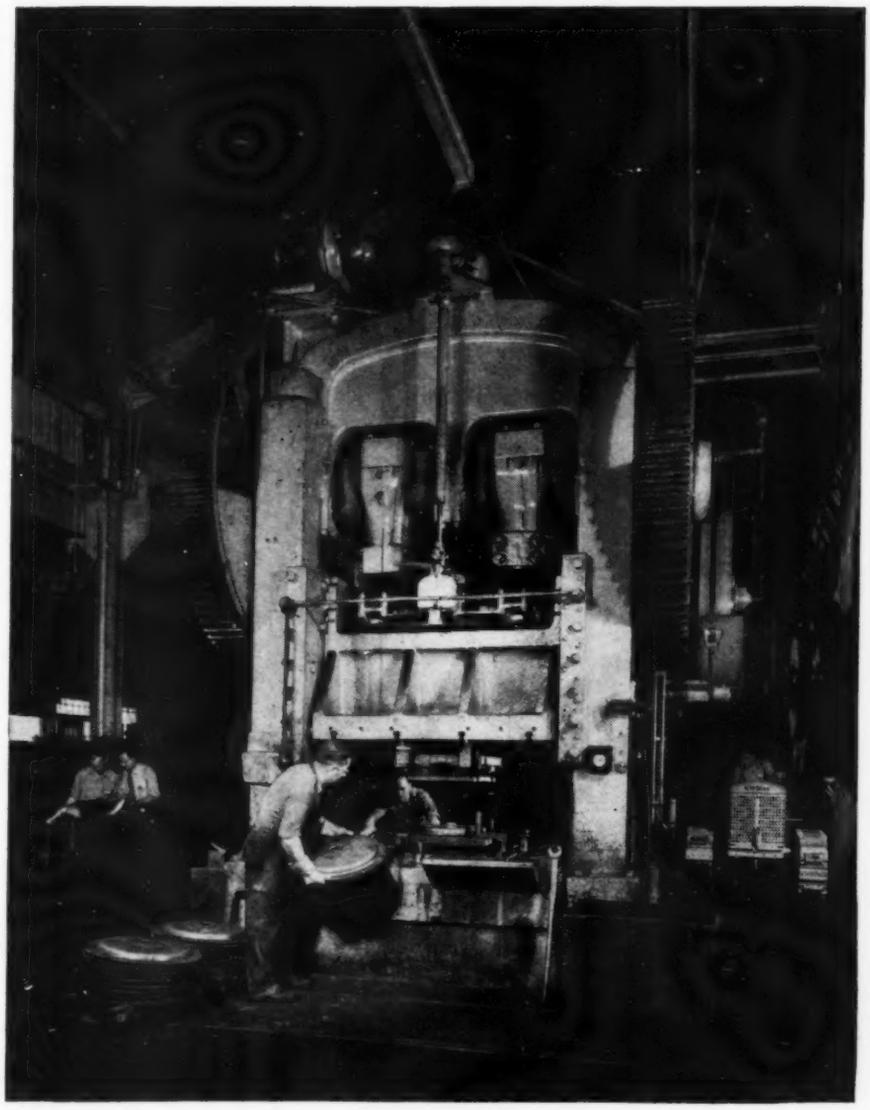
***Highway Products Division*—5701 W. 26th St., Chicago, Ill.**

Manufacturing Division, Concrete Engineering Division, Sheet Steel and Wire Division

Convenient Check List of Ceco Highway Products

Welded Wire Fabric • Metal Center Strip • Dowel Bars • Stake Pins • Dowel Bar Supports • Expansion Joints • Dowel Bar Sockets • Cecure Compound • Sub-Grade Paper

ENGINEERING MAKES THE BIG DIFFERENCE IN CECO CONSTRUCTION PRODUCTS



Forming rear wheel discs on a 450-ton press in the Oliver "Cletrac" plant.

This is a pressing matter!

In this huge 450-ton press, many heavy precision parts are formed for Oliver "Cletrac" crawler tractors. Like clockwork, a part is formed every few seconds . . . another example of the modern production methods and equipment that permit Oliver "Cletrac" to build in added quality at no extra cost to the user.

Quality is the keynote that characterizes every Oliver "Cletrac" crawler tractor . . . in design, workmanship, materials and performance . . . quality that means years of dependable, economical service.

Maintenance of this standard enables your Oliver "Cletrac" dealer to offer you the finest in crawler tractors . . . for your every need.

CLETRAC

a product of **The OLIVER Corporation**

THE OLIVER CORPORATION Cletrac

You *CAN take it with you ..

wherever you need *Steam!*

A perfected, highly efficient portable steam generator — on wheels — you can tow this unit with car or truck anywhere you need steam — tank-car siding, construction site, material yard or other location.

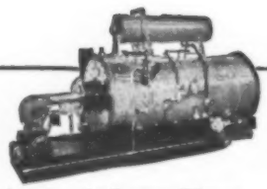
In tank-car heating with the Cleaver-Brooks heater you have hot dry steam flowing to the car coils from a cold start in 20 minutes or less. And you can keep going all day with the least work and bother because a Cleaver-Brooks tank-car heater requires less fuel and water. The famous and exclusive four-pass flue travel construction means low fuel consumption; the turbine type condensate return system cuts water loss—every drop of condensate goes back to heater under pressure.

Built for full capacity — full-time work — Cleaver-Brooks tank-car heaters will give you the most in production hours on the job. Wherever in service, Cleaver-Brooks are usually given the tough jobs because of their known reliability.

Write today—get bulletins and complete information from Cleaver-Brooks—the pioneers and originators of tank-car heaters and bituminous boosters.

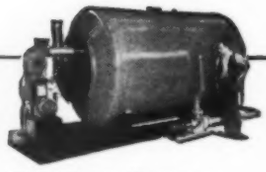
CLEAVER-BROOKS COMPANY

5106 N. 33rd Street • Milwaukee 9, Wisconsin



Automatic Steam Plants

Completely self contained; highly efficient; require only simple piping connections to place in operation. Fully automatic fuel-oil burner; condensate recovery and feed water pumping system; no stack needed, sizes from 20 to 500 h.p.; pressures 15 to 200 lbs.

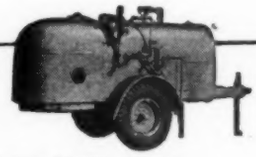


Hot Water Boosters

Oil-fired; fully automatic or manual operation; no licensed engineer needed; two capacity sizes: 3000 gals. storage tank for 1600 gals. of water heated 150° F. per hour; 1500 gals. storage tank for 800 gals. of water heated 150° F. per hour.

Portable Pumping Boosters

Heats bituminous material by direct firing in one operation, loading directly to distributor, relay truck or returning to tank car. Two sizes, truck mounting or 4-wheel trailer.



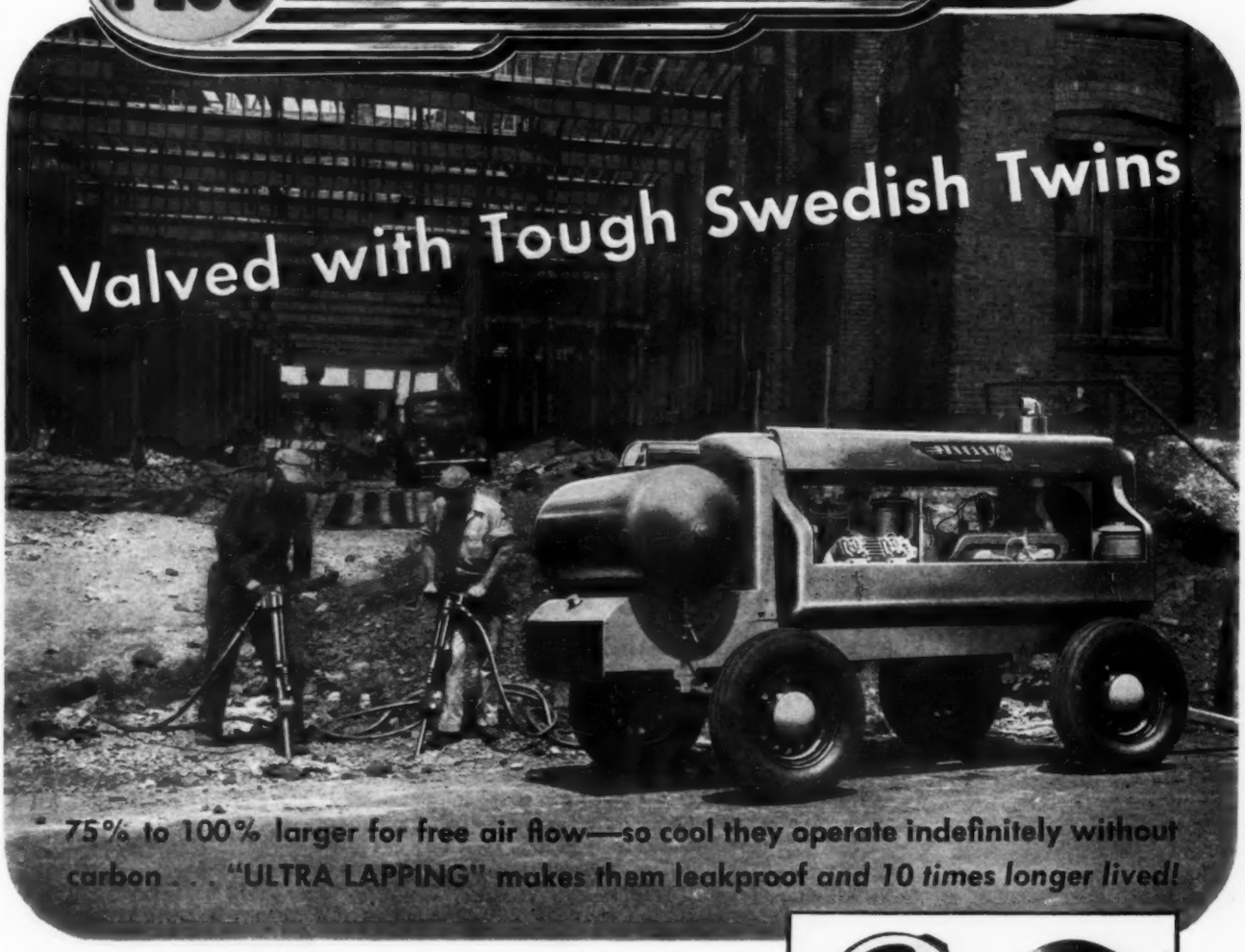
Portable Tank-Car Heaters

Available in 2 and 3 tank-car sizes. Oil-fired with exclusive four-pass flue travel; dry-coil steam condensate return under pressure — no water or heat loss. Provides a portable source of steam wherever needed.

Cleaver-Brooks

***Pioneers and Originators of* *TANK CAR HEATERS *BITUMINOUS BOOSTERS *AUTOMATIC STEAM-PLANTS**

AIR PLUS JAEGER COMPRESSOR



75% to 100% larger for free air flow—so cool they operate indefinitely without carbon . . . "ULTRA LAPPING" makes them leakproof *and 10 times longer lived!*

The heart of every "AIR PLUS" Compressor is a set of Swedish Twins . . . steel chosen for its toughness and carefully hardened . . . "ultra lapped" by Jaeger's exclusive process to form perfect seating, leakproof valves and make them 10 times longer lived . . . doubled in size to let the air flow freely, eliminating heat, carbon and power-wasting back pressure, and to operate with lower lift and a resulting minimum of wear. Send for Catalog JC-5. It shows you why compressor users are demanding "AIR PLUS."

THE JAEGER MACHINE CO., Columbus 16, Ohio

REGIONAL OFFICES:	8 E. 48th St. NEW YORK 17, N. Y.	226 N. LaSalle St. CHICAGO 1, ILL.	235-38 Martin Bldg. BIRMINGHAM 1, ALA.

"FLEET-FOOT" LOADERS

"SPEEDLINE" MIXERS

"SURE-PRIME" PUMPS

"AIR-PLUS" COMPRESSORS

JAEGER *Engineered* EQUIPMENT

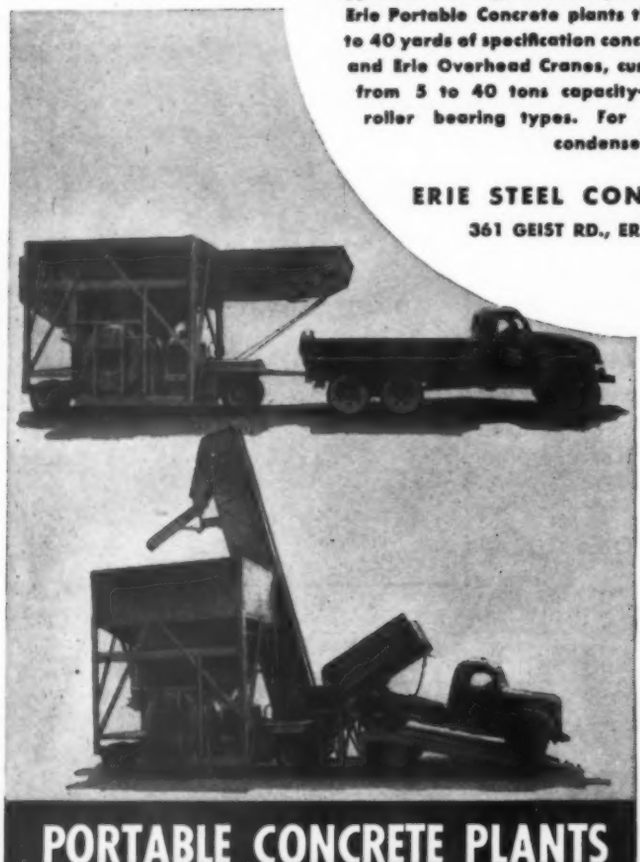
JAEGER-LAKEWOOD SPREADERS, FINISHERS AND BITUMINOUS PAVERS, FORMS, FORM TAMPERS—"DUAL-MIX" TRUCK MIXERS, AGITATORS—JAEGER HOISTING ENGINES, TOWERS

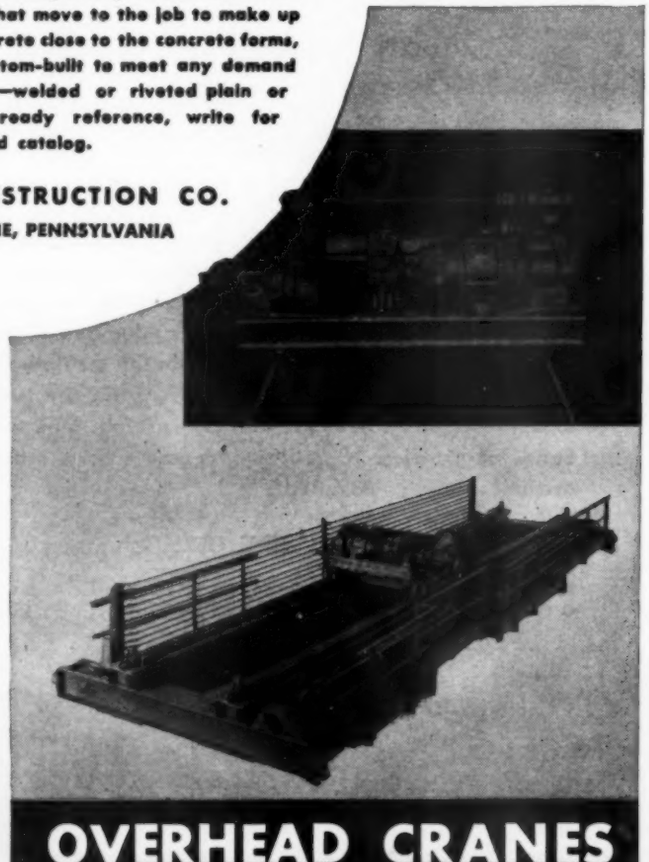
ERIE

THE BIG 4 LINE

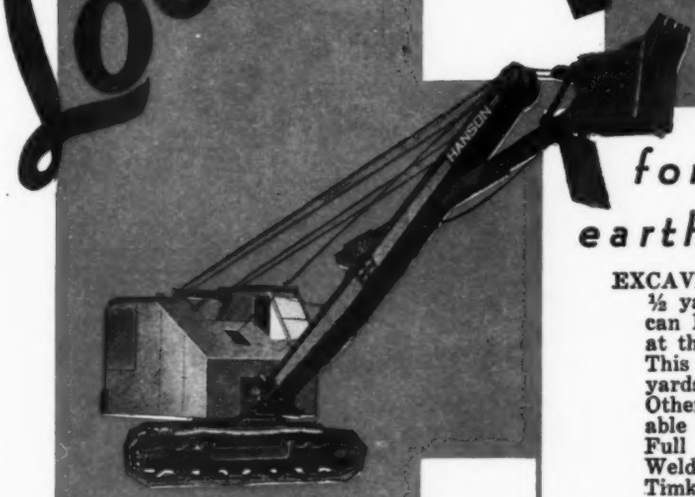
ERIE builds the most complete line of buckets: Handling, Rehandling, Light Diggers, Heavy Diggers, Single Line Hook-On type for intermittent hook and bucket work, also Strayer-Electric Hook-on and Draglines in sizes and weights for the job and crane. • Erie AggreMeters portable and permanent types for storing, measuring and dispensing of bulk material • Erie Portable Concrete plants that move to the job to make up to 40 yards of specification concrete close to the concrete forms, and Erie Overhead Cranes, custom-built to meet any demand from 5 to 40 tons capacity—welded or riveted plain or roller bearing types. For ready reference, write for condensed catalog.

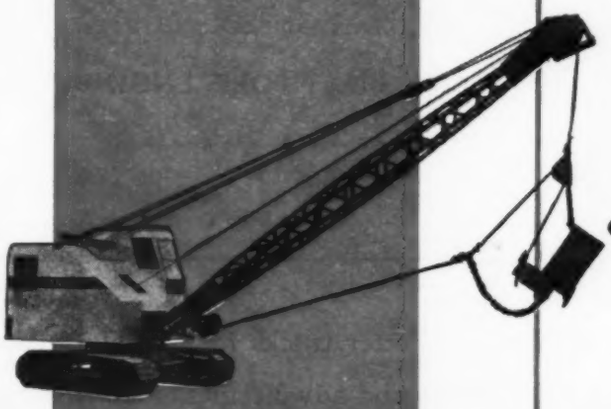
ERIE STEEL CONSTRUCTION CO.
361 GEIST RD., ERIE, PENNSYLVANIA





Look to HANSON





for THE BEST in earth-handling equipment

EXCAVATORS -- that really produce. In ⅜ yard and ½ yard sizes (Models 31 and 41). The excavator that can Hoist, Crowd and Swing or Propel and Steer all at the same time!
This design feature will enable you to handle more yards per hour -- make more dollars per hour.
Other Hanson features that mean dependable, profitable operation on your excavating jobs --
Full revolving. Chain crowd. Low center of gravity. Welded steel construction. Large area crawlers. Timken roller bearings.

CRANES -- that make money for you. In 4 ton and 6 ton sizes -- Gasoline or Diesel.
It's a crane that has demonstrated its rugged strength time and again. It's the outgrowth of 30 years experience in this machinery field, combining scientific design and manufacturing skill. A study of these features -- a short conversation with a Hanson owner will convince you that Hanson is the buy!
Convertible to: Shovel, Trench Hoe, Dragline, Clamshell, Piledriver.

All ways a producer -- always dependable.

OTHER HANSON PRODUCERS

(1) **Truck shovels and Cranes.**
Shovels and cranes shown above (Models 31 and 41) are also available as truck mounted instead of crawler mounted.

(2) **Yard & Dock Cranes**
A mobile, one-man unit, 2 to 4 ton life and carry, 360° swing, 2 to 40 M.P.H.

(3) **Heavy Duty Trailers**
Ideal for hauling contractors' heavy equipment. Available as either semi or full trailer with capacities from 10 to 40 tons. Gooseneck type, massive H beam construction -- tough as Gibralter! Oscillating rear axle construction assures a level, safe ride. Just the answer to your equipment haulage problem.
Write for complete catalogs and specifications on any or all of this equipment.

ARMY E NAVY

THE HANSON CLUTCH AND MACHINERY CO.
TIFFIN · OHIO

TWO GREAT FORD ENGINES

The 100 H.P. V-8 • The 90 H.P. Six
Three-Quarter-Floating Rear Axle

BODY DIMENSIONS: Length 78¾ inches • Width 49 inches • Height 20.22 inches • Loading Height 23.73 inches • Load Space 45 cu. feet

New Ford Pickup Truck • Today's Ford Pickups are better trucks for *your* business. They're better trucks for *any* business. Exclusive Ford features and advancements make them roadworthy—streetworthy—farmworthy. Look below. You'll find advantages only Ford can offer—reasons why, year after year, registrations show "More Ford Trucks on the Road!"

MORE ECONOMICAL, MORE RELIABLE, MORE ENDURING THAN EVER!

TWO great engines—the rugged 100 H.P. V-8 with a score of important engineering advancements, or the 90 H.P. Six, for jobs that call for economical stop-and-go driving. Truck-type frame. Side-mounted springs. Three-quarter-floating rear axle with straddle-mounted pinion and 4-pinion differential. Four double-action shock absorbers. Note the generous dimensions of the heavy-gage steel Ford Pickup body, shown above—45 cubic feet of load space—wide enough for easy flat-loading of such 4-foot units as plywood or plasterboard (no wheel housings). Floor is heavy-gage steel-surfaced, with formed skid-strips and hardwood under-flooring. Tailgate, strong and rattle-free, swings full-down for loading.

Priorities No Longer Needed. Ford **See Your Ford Dealer!** **FORD TRUCKS**

Zoned Equipment

ZONE 1
"Caterpillar" Diesel track-type Tractors equipped with bull-dozers.

ZONE 2
"Caterpillar" Diesel track-type Tractors for loading and pulling scrapers.

ZONE 3
"Caterpillar" Diesel wheel-type Tractors for high-speed hauls.

DOES THE JOB *better, quicker, cheaper*

"Use the right tool for the job" is an old rule—and a sound one—that is followed in every successful factory, shop or craftsmen's trade. It is just as applicable in the great industry of earthmoving. Contractor, customer and community alike benefit when it is put into practice.

Here, for instance, on the Canton-Akron airport project, three contracting concerns got together in setting the job up *right*—with ZONED EQUIPMENT to fit the varying hauls.★ And that's the one "best" way to get top results on *any* large earthmoving operation.

The "Caterpillar" line has been steadily broadened to enable the contractor to "zone" his jobs with equipment obtained completely from *one source*—under the quality-and-performance responsibility of *one manufacturer*—and serviced through *one dealer* organization that is thoroughly equipped, experienced and always within easy reach.

What do *you* need to zone your next jobs for better, quicker, more profitable results? Talk it over with your "Caterpillar" dealer. And keep in mind that "Caterpillar" *job-engineering* help is available if you want it.

★Illustrations show some of the *zoned equipment* used on this project. It includes 8 "Caterpillar" track-type Tractors operating carry-scrapers on heavy hauls of 1000 feet and under; 3 operating 'dozers on the "push" distances; and 8 "Caterpillar" Diesel wheel-type Tractors operating scrapers on the "speed" hauls of 2000 feet and over.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR DIESEL

REG. U.S. PAT. OFF.

ENGINES • TRACTORS • MOTOR GRADERS • EARTHMOVING EQUIPMENT

The discharged veteran wears this emblem. Remember his service and honor him.

MORE CONTRACTORS

are switching to Job-Rated trucks

IT WAS no "wartime secret" that owners of Dodge *Job-Rated* trucks experienced consistent "on-the-job" operation. Because their trucks *fit the job*, they performed more efficiently, operated more economically, lasted longer.

That's why today so many more contractors are planning to standardize on precision-built Dodge *Job-Rated* trucks.

They're buying trucks with engines rated for their loads. They're getting trucks with a transmission and clutch, with axles, springs and every other unit *Job-Rated* to handle the job . . . to do a better job, longer, and at low cost!

DODGE DIVISION OF CHRYSLER CORPORATION

LISTEN TO THE MUSIC OF ANDRE KOSTELANETZ, WITH FAMOUS GUEST STARS
THURSDAYS, C. B. S., 9 P. M., E. T.

4

WARTIME YEARS PROVED PLENTY

Two "eye-opening" facts that will long be remembered by men to whom trucks were a "bread and butter" proposition during wartime, are these:

1 There's no substitute for years of truck-building experience, or for precise workmanship and quality . . . major reasons for the economy, dependability and long life of Dodge Job-Rated trucks.

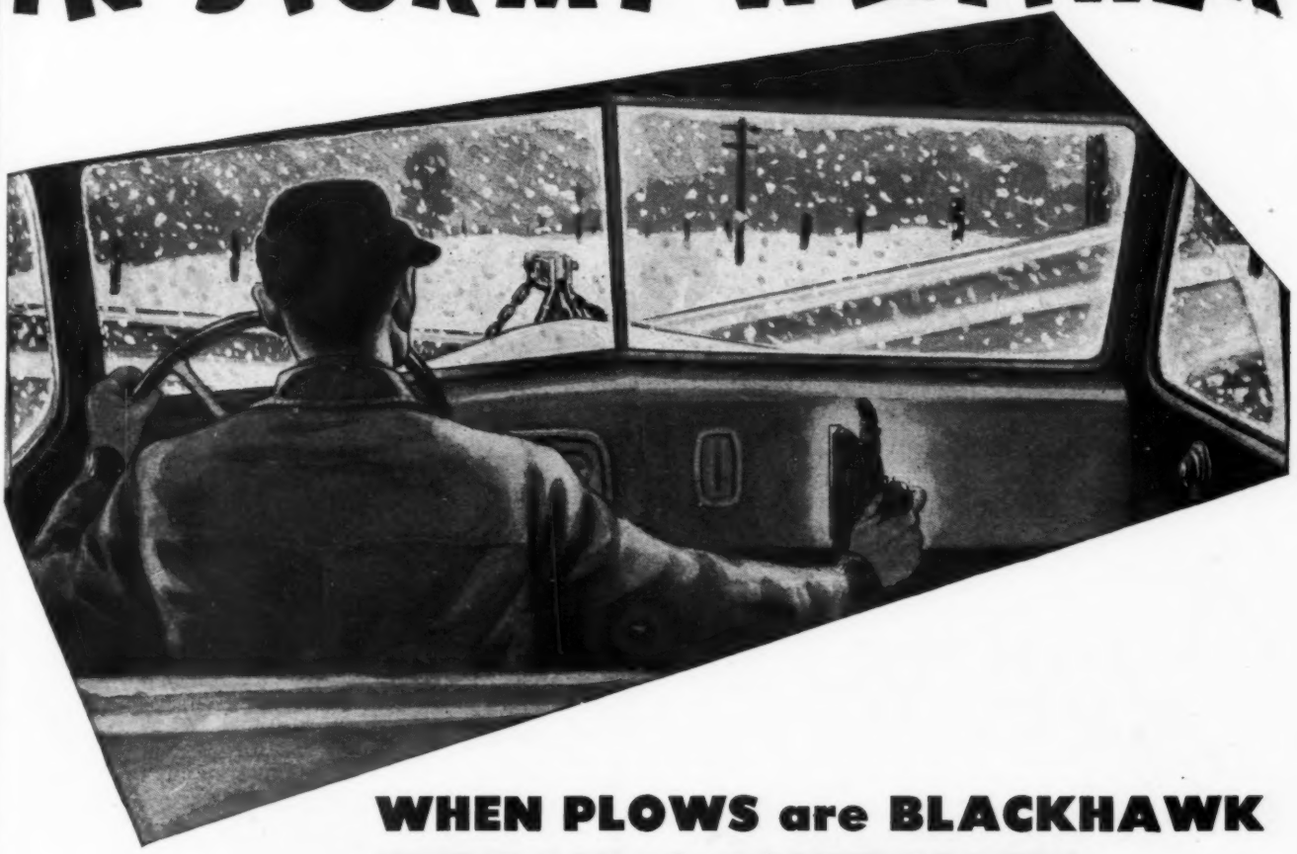
2 Dodge Job-Rated trucks stayed on the job because of the ready availability of Dodge TRUCK PARTS and because of the prompt, efficient truck service of Dodge dealers.

See your Dodge dealer Now! Let him help you choose the right Dodge Job-Rated truck for all your hauling needs!

DODGE *Job-Rated* TRUCKS

FIT THE JOB . . . LAST LONGER

Smooth Sailing
IN STORMY WEATHER



WHEN PLOWS are BLACKHAWK HYDRAULIC CONTROLLED!

A flick of a valve and the Blackhawk Hydraulic System adjusts the blades for another bite into the blizzard. And like the men who use 'em, the men who build 'em know the ease, speed and accuracy with which Blackhawk Hydraulic Controls lift and lower plow blades. That's why Blackhawk is standard equipment with 9 out of 10 snow plow manufacturers. For dependable performance specify Blackhawk Hydraulics on ALL your road equipment. For complete information on the advantages of Blackhawk Hydraulic Controls, write your equipment manufacturer.

To Equipment Manufacturers:

Blackhawk Hydraulic Controls are engineered and priced for *quantity* purchase and *practical* installation on your products for even greater customer satisfaction. Submit your hydraulic problems to us. We will work with you in confidence.

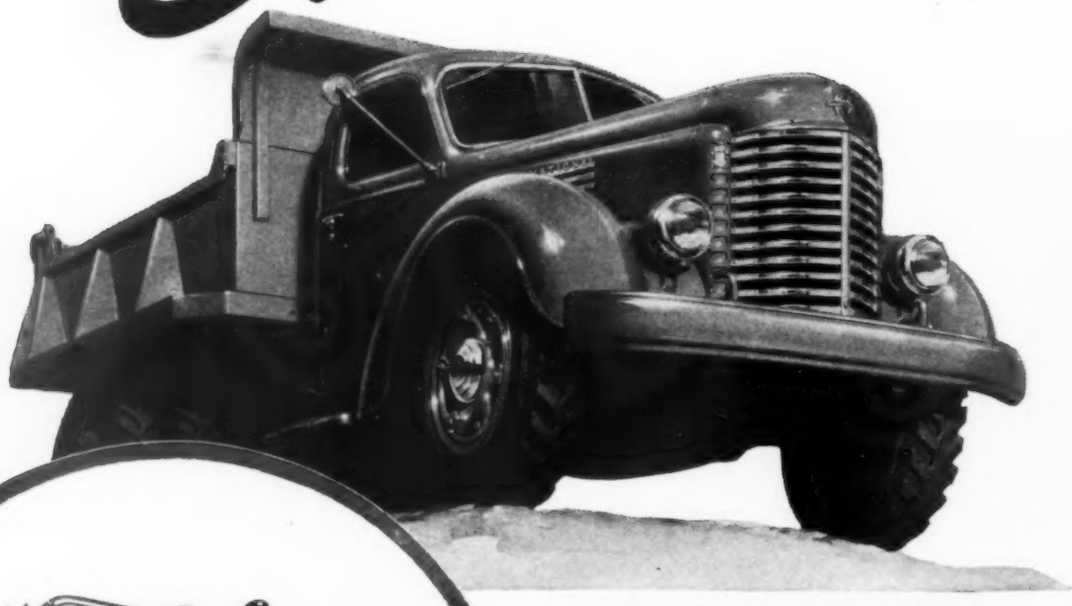
POWER - DRIVEN P-104 Power-Packer Pump—belt or gear-driven control valve is operated from cab. Compact, easily installed.

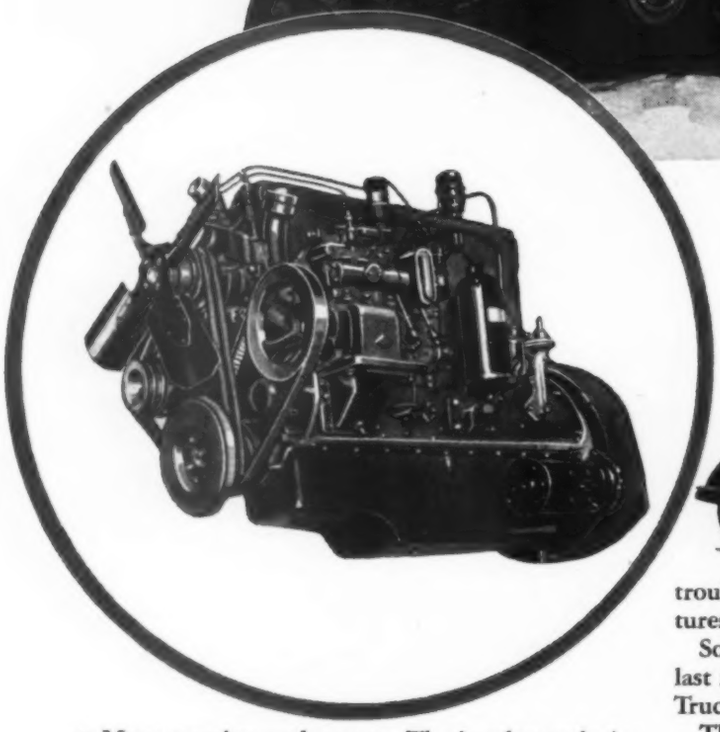
HAND OPERATED P-60 Power-Packer Pump mounts in cab. Blackhawk is also the source for RAMS and VALVES for use with these pumps.

A Product of **BLACKHAWK MFG. CO., Dept. BR, Milwaukee 1, Wis.**

BLACKHAWK
Hydraulic Controls

TRUCK *Stamina*





FOR TOUGH TRANSPORT

• More stamina and power. That's what today's International Trucks deliver.

Note the International Red Diamond Engine in the picture. This famous engine powers the bigger Internationals. Now has longer life, because of greater strength, as well as added power.

Improvements have been made in International Truck Chassis, too—improvements to step up even further the economy, ease of operation and long, trouble-free service that are the outstanding features of International Truck performance.

So outstanding is this performance that in the last fourteen years more heavy-duty International Trucks have been sold than any other make.

The International Truck Line is a complete line, with a truck of the right size and carrying capacity for every job. And back of every truck are these top service facilities—a network of International Truck Dealers and a system of International Truck Branches that form the nation's largest company-owned truck service organization.

INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

LISTEN TO "HARVEST OF STARS" EVERY SUNDAY! NBC NETWORK

INTERNATIONAL

INTERNATIONAL Trucks

UNIT 514

So Easy to Handle

CRANE

CLAMSHELL

DRAGLINE

TRENCHOE

MAGNET

Convertible TO ALL ATTACHMENTS

Full-Vision Cab ... ENABLES OPERATOR TO SEE IN ALL DIRECTIONS

Here's a sturdy, nimble ½-yard excavator with compact, streamlined design . . . built for safe, efficient operation. Fast, finger-tip responsiveness. All controls within easy reach of operator. Automatic, foolproof traction brakes. New full vision cab, equipped with shatter-proof glass, promotes safety and increases operating efficiency.

CONTACT FACTORY DIRECT
FOR PRICE AND DELIVERY

½ AND ¾ YD. EXCAVATORS — 5 TO 10 TON CRANES

UNIT CRANE & SHOVEL CORP. MILWAUKEE 14, WISCONSIN, U.S.A.

A4873-1PC-R

NO BED OF ROSES

Hercules WD-12 heavy duty dump body, with pyramid type steel side braces and heavy boxed corners. This unit, of four cubic yard capacity, is equipped with a Hercules 8X Hoist.

There's a long, rugged life ahead of these new Hercules units . . . long hours and punishing service under the most difficult operating conditions. That's what railroad construction and maintenance of way work means . . . constant, driving work, day after day, with every job marked "Rush". But these heavy duty bodies and hoists will measure up to the task because each unit is designed and built for the toughest kind of service. All the jobs, under any conditions, will be finished on time and right.

Whether your haulage work is as difficult as this or not, it's nice to know that your equipment, built by Hercules, will deliver a full measure of satisfactory, low-cost service every day. Whatever your haulage problem, there's a Hercules unit built to help you get the work done in less time and at lower cost. Write today for complete information.

Address inquiries to Dept. I.

●

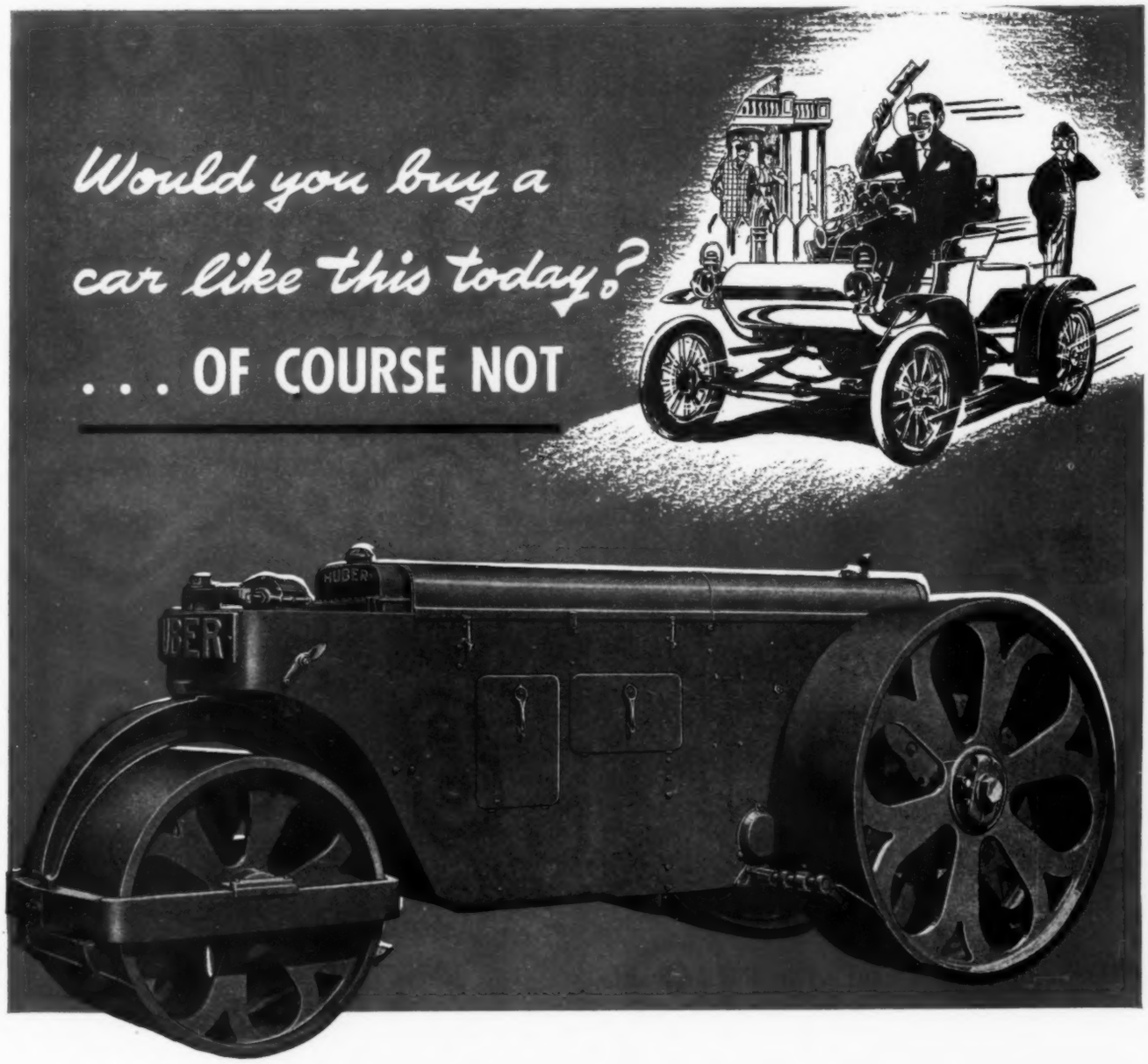
HERCULES

DUMP BODIES AND HYDRAULIC HOISTS
SPLIT SHAFT POWER TAKE-OFFS • COAL CONVEYORS

ONLY HERCULES HAS *ALL* THESE FEATURES

Center-Lift Hoist • Reversible Tailgate Hardware • Piston-Type Control Valve Hoist Mounts Above Frame • Easy-Reach Tailgate Lever • Accessible Hoist Cylinder Dash Controls for Hoist and Take-Off Patented Tire and Tool Pack

HERCULES STEEL PRODUCTS COMPANY . . . GALION, OHIO



Just as 1946 motor travel calls for a modern automobile, today's construction job demands an up-to-the-minute roller— a HUBER HEVI-DUTY. Rugged, heavy solidness for the toughest punishment plus power and speed to spare — that's the HUBER HEVI-DUTY, available in 10 and 12 ton sizes. Let us tell you the whole story.

THE HUBER MFG. COMPANY • MARION, OHIO, U. S. A.

HUBER ROLLERS

Increased Yardage *and* Lower Hauling Costs *on Off-the-Highway Jobs*

Whether it is coal hauling in Pennsylvania, dam construction in Idaho, or any job of moving earth and other materials, Euclids step up production and cut hauling costs. Because they are designed and built for the toughest jobs, Euclids have an unsurpassed range of usefulness and can handle all types of material on all lengths of haul at lower operating and maintenance costs. With their large payload capacity and speed on the haul road, this means savings in time and money — lower costs per ton or yard moved.

If you're using equipment that limits the type of work and lengths of haul you can handle economically, and can't take the tough jobs in stride, you will want to get complete information on Euclids. Literature and the recommendations of a hauling equipment specialist are available from your Euclid distributor or by writing direct, as you prefer.

The EUCLID ROAD MACHINERY Co. · · · Cleveland 17, Ohio

EUCLID SELF-POWERED HAULING EQUIPMENT For EARTH . . ROCK . . COAL . . ORE

EUCLID THE PIONEER

CANADIAN DISTRIBUTORS:

LAURENTIDE EQUIPMENT CO., LTD.
440 Beaumont Ave., Montreal, Que.

CANADA INGOT IRON CO., LTD.
8302 103rd St., Edmonton So., Alta.

BROWN, FRASER & CO., LTD.
1150 Homer St., Vancouver, B. C.

KIPP KELLY LTD., 68 Higgins Ave., Winnipeg, Man.

CODSALL & CO. LTD., 435 Keating St., Toronto, Ont.

CONTRACTORS: When you need construction equipment here's a simple, LOW COST method of financing that makes it easy for you to buy whatever is required.

LET C.I.T. FINANCE YOUR PURCHASES: Be ready to bid successfully on the projects available. If you can increase your profits by owning the proper equipment, C.I.T. can help you acquire it.

There are no long, drawn-out negotiations. Tell us what you want to buy and we'll handle every detail promptly or, ask your distributor to arrange C.I.T. financing. We'll be happy to serve you and him.

HERE ARE THE PRACTICAL FEATURES

IMMEDIATE CASH to complete purchases of machinery, equipment, gear, engines.

•

TAKE MANY MONTHS to amortize the investment and let the equipment help pay for itself.

•

COMBINE SEVERAL PURCHASES, if desired, in one obligation.

•

CONSERVE your own working capital for payrolls, taxes, supplies, other expenses.

•

ANY AMOUNT, available promptly, LOW COST.

CIT
The Mark of LEADERSHIP

C.I.T. CORPORATION

INDUSTRIAL FINANCING

OFFICES:
ONE PARK AVENUE,
NEW YORK, N. Y.

★

333 N. Michigan Avenue
CHICAGO, ILL.

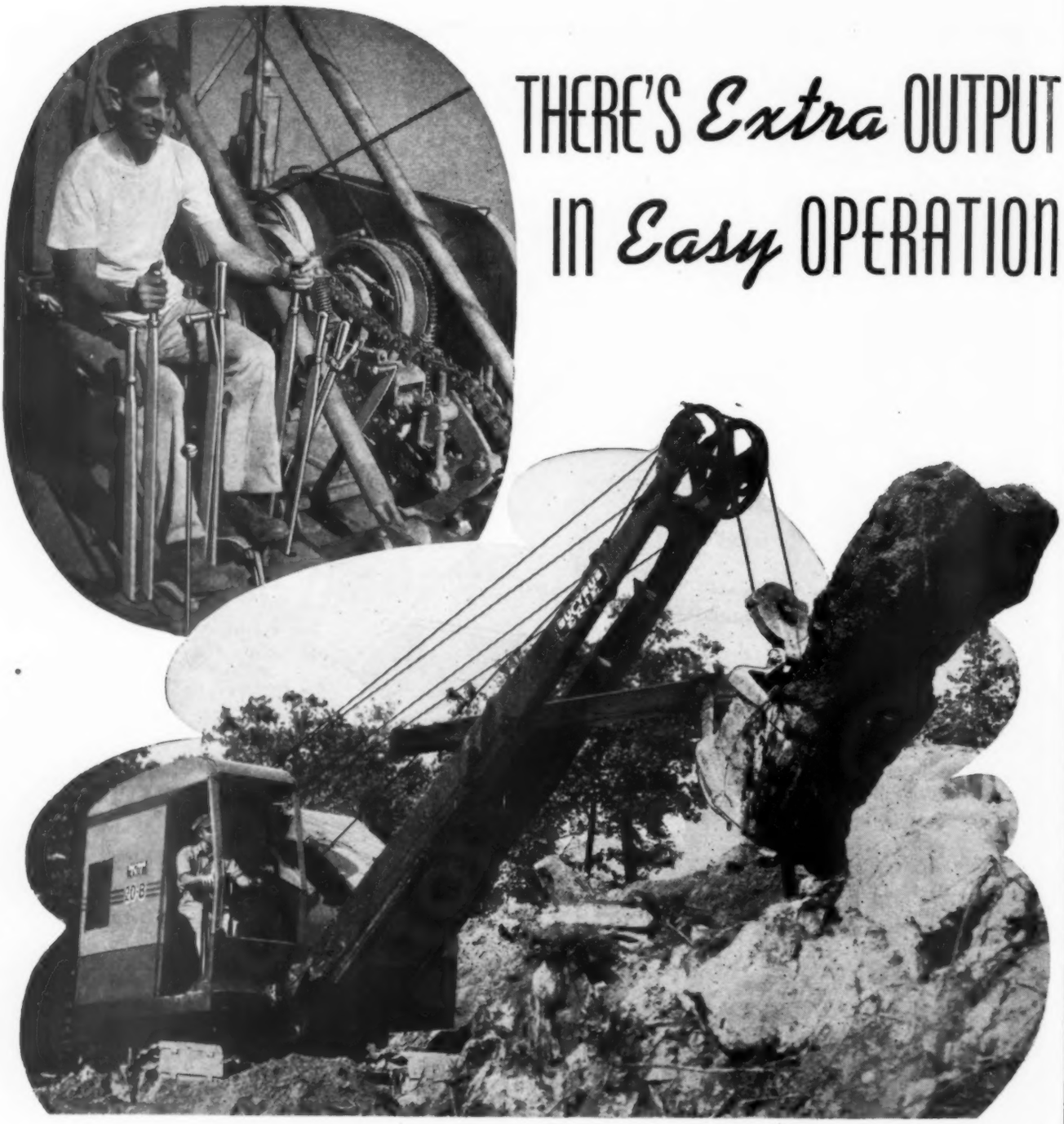
★

660 Market Street
SAN FRANCISCO, CALIF.

★

In Canada:
CANADIAN ACCEPTANCE CORPORATION *Limited*
Metropolitan Building, Toronto

AFFILIATED WITH COMMERCIAL INVESTMENT TRUST INCORPORATED



THERE'S *Extra* OUTPUT IN *Easy* OPERATION

The toughest kinds of civilian and military digging have proved the output value of the full, smooth control you get with ⅜-, ½-, and ¾-yard Bucyrus-Eries. Accurate feel, smooth quick response, and properly proportioned power make it easy for the operator to combine crowd, hoist, and swing for big output. He is in direct control during every part of the digging cycle, permitting him to set an even, high-speed digging pace. The conveniently located, easily moved levers and the comfortable cab reduce his fatigue, let him maintain the fast pace for long periods.

9E45

Besides full, smooth control there are numerous other reasons why Bucyrus-Eries are leading yardage-producers. The full Bucyrus-Erie performance story will convince you.

SO. MILWAUKEE **BUCYRUS ERIE** WISCONSIN

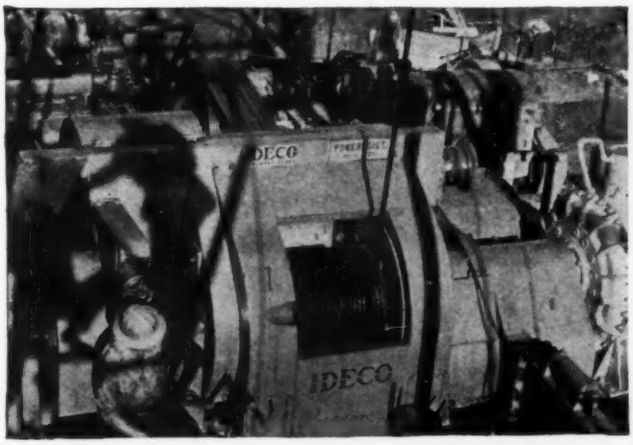
THE CLUTCH THAT STOPPED CLUTCH TROUBLE

Here is the one truly modern clutch for all heavy duty industrial drives.

It controls power and torque through a cushion of air —with as firm a grip or as light a grip as the job requires. It has no springs, arms, levers or toggles—requires *no* lubrication and little maintenance.

It is the Fawick Airflex Clutch—proved for superior performance and economy—in hundreds of industrial applications and in thousands of Diesel-driven Navy ships.

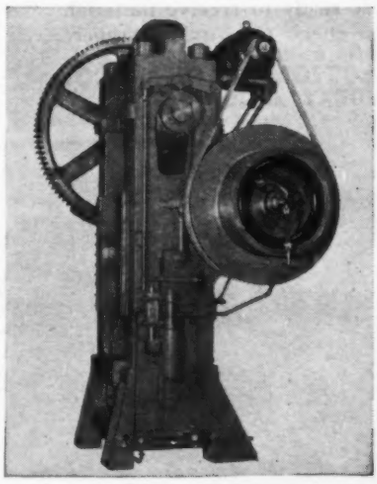
Let us help you engineer clutch trouble *out* of your machines. Book on request.



Oil-well drilling rig—equipped with 11 Fawick Clutches.

▲ Modern power shovel gives full-time operation through dependable Fawick Clutches.

Steel rolling mill Fawick-equipped for smooth, even power.



◀ Heavy duty press has smooth starts and quick stops with Fawick Clutch and Brake.

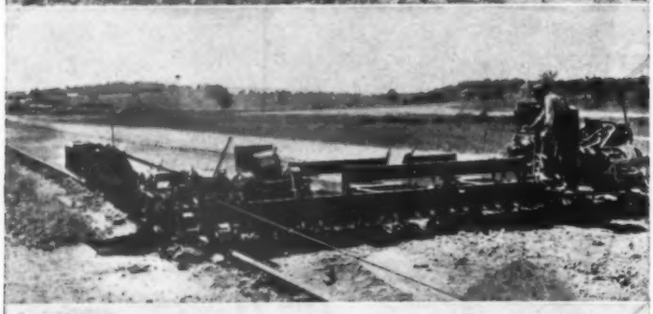
▶ Alligator shear operates through Fawick Clutch and Brake.

FAWICK *Airflex* CLUTCH

FAWICK AIRFLEX CO., INC. • 9919 Clinton Road, Cleveland 11, Ohio

In Canada, Reynold-Coventry Ltd., Montreal, Toronto, Vancouver • In British Commonwealth, Crofts Engineers, Ltd., Bradford, England

Buckeye COST CUTTING *Super Six* FOR HIGHWAY CONTRACTORS



1. BUCKEYE CLIPPER ½ and ¾ yard convertible power shovels have "Mevac" Metered Vacuum Power Control, exclusively. Operator gets better "feel," quicker response.
2. BUCKEYE MATERIAL SPREADERS for seal coating and road maintenance, spread material evenly and in measured quantities.
3. BUCKEYE R-B FINEGRADERS provide in one operation a smooth, level, compact subgrade ready for the paver.
4. BUCKEYE TRENCHERS — a model for every trenching requirement — dig through any material short of solid rock. They will cut your trenching costs to the bone.
5. BUCKEYE DOZERS AND TRAILBUILDERS dig in and move bigger loads with less tractor effort—save time and money on any job.
6. BUCKEYE HIGHWAY WIDENERS cut smooth, clean trench of uniform width and depth, true to grade, leaving subgrade ready to receive material.

For the close bid jobs check the Buckeye Super Six. Send for bulletins.

BUCKEYE TRACTION DITCHER CO.
FINDLAY, OHIO

built by **Buckeye**

CONVERTIBLE SHOVELS — BULLDOZERS — ROAD WIDENERS
TRENCHERS — MATERIAL SPREADERS — R-B FINEGRADERS

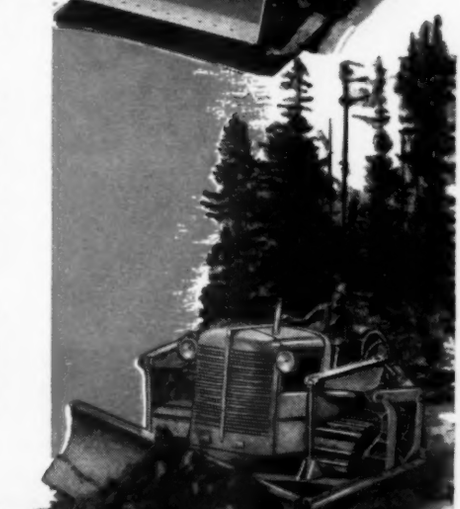
Here's teamwork FOR YOUR earth moving jobs

GAR WOOD ROAD MACHINERY
WITH ALLIS-CHALMERS DIESEL POWER

The experience of successful contractors and public construction officials has shown that it takes teamwork to get earth moving jobs done on time and at lowest cost. When your operators and equipment work together with you as a team, you have a really unbeatable combination.

In organizing such a team, a logical place to start is with your equipment. Gar Wood Road Machinery and Allis-Chalmers Diesel Tractors are already "teamed up" for high efficiency operation because they are engineered and built to work as a team. And this dependable, proved equipment wins the enthusiastic cooperation of operators because it gets jobs done with the least effort and the utmost convenience and speed.

You benefit too by the nation-wide service of the strong Allis-Chalmers and Gar Wood factory organizations through your local dealer—always helpful service that keeps your equipment going. Get this teamwork on your jobs. Order Gar Wood Road Machinery now from your Allis-Chalmers dealer.



GW ROAD MACHINERY
is Sold Through
ALLIS-CHALMERS
Dealers Everywhere

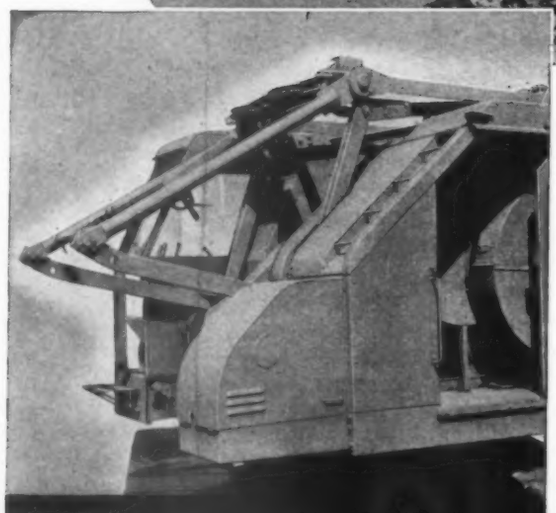
ROAD MACHINERY DIVISION
GAR WOOD INDUSTRIES, Inc.
DETROIT 11, MICHIGAN

OTHER PRODUCTS OF GAR WOOD INDUSTRIES INCLUDE HOISTS AND BODIES • WINCHES AND CRANES • TANKS • HEATING EQUIPMENT • MOTOR BOATS

KOEHRING

605

POWER RAISES, LOWERS HIGH A-FRAME FAST...



High A-Frame folds up like this after two pins are removed.

Because **power raises and lowers the High A-Frame fast, you cut moving expenses every time you ship the new Koehring 30-ton crane by rail, every time you truck it through a highway underpass, every time you move it under overhead obstructions on the job. In just a few minutes you reduce overhead clearance from 18'-8" to 12'-9".**

REMOVE 2 PINS, THAT'S ALL

Raising or lowering the 605 High A-Frame is simple, safe. Remove 2 pins and the High A-Frame is ready for lowering by power. A cable attached to the hoist-drum controls lowering speed. The same cable raises the 605 High A-Frame back into position. No danger of over-pulling because the High A-Frame comes to a definite stop when fully raised.

SUSPENSION CABLES STAY ON

Boom suspension cables stay in place on short moves. Because the frame is strong, the Koehring 605 crane may be operated with the High A-Frame in any lowered position.

ASK FOR YOUR 605 CATALOG TODAY!

KOEHRING COMPANY
MILWAUKEE 10, WISCONSIN

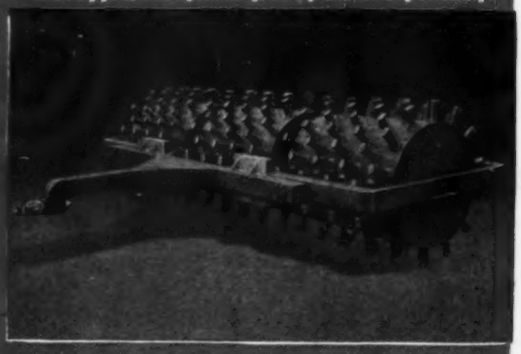
KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Heil Hi-Speed Cable Scrapers "bite deep"

to give you bonus loads

Heil Cable-operated Bulldozers and Trailbuilders are rugged, fast-operating, and perform dependably.



Heil Tamping Rollers are designed and built to give you a highly satisfactory tamping action.

Heil Hi-Speed Bottom Dump Wagons have high clearance doors operating on a clam-shell principle.

Positive down-pressure on the cutting blade insures rapid soil penetration and faster digging action in any kind of dirt. These units really "bite deep" to give you a heaped 15-yard load in 40 to 50 seconds.

Fast acceleration and high travel speeds enable your operators to cut round-trip time and secure top operating efficiency, particularly on long hauls.

At the fill, this famous Hi-Speed Scraper spreads its load with a positive mechanical push-out action secured by tilting the floor. This fast-action discharge is accomplished by a leverage action which exerts a *low line pull* on the unloading cable. The cutting blade remains in a fixed position in relation to the sides of the bowl and does not tilt with the dumping floor. Thus the load can be spread at any desired height, and at travel speeds permitted by the grade.

Ask your Heil distributor for the details. Specify "Heil" on all dirt-moving equipment and be assured of fast, profitable dirt-moving at low cost per yard.

R-50.

THE HEIL CO.

GENERAL OFFICES • MILWAUKEE 1, WISCONSIN

One Link-Belt Speeder DOES MANY DIFFERENT JOBS!

Owners of Link-Belt Speeder machines enjoy year-round utility on many types of jobs, from the same rugged, powerful, easy-to-operate unit.

Quick Convertibility MAKES LINK-BELT SPEEDER THE MOST USEFUL MACHINE ON THE JOB!

Many a job begins and ends in the cab of a LINK-BELT SPEEDER, first fitted with shovel for excavating, or with dragline for clearing the site, then with boom and hook-block for placing concrete and erecting steel. Underground pipe lines are laid with the aid of the trench-hoe, and finally the grading and clean-up work finished off with the dragline again!

For Prompt, Efficient, Convenient Sales and Service:
There is a Link-Belt Speeder Distributor Located Near You

10,170

LINK-BELT SPEEDER

Builders of the Most Complete Line of
SHOVELS-CRANES-DRAGLINES

LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO 9, ILL.
A DIVISION OF LINK-BELT COMPANY

YOU DON'T HAVE TO

RE-DESIGN

THE VEHICLE TO APPLY VICKERS Hydraulic Power Steering

Vickers Hydraulic Power Steering requires minimum space and can be located where it does not interfere with other apparatus. In nearly all cases it is easily applied to existing vehicle design with only a few simple alterations.

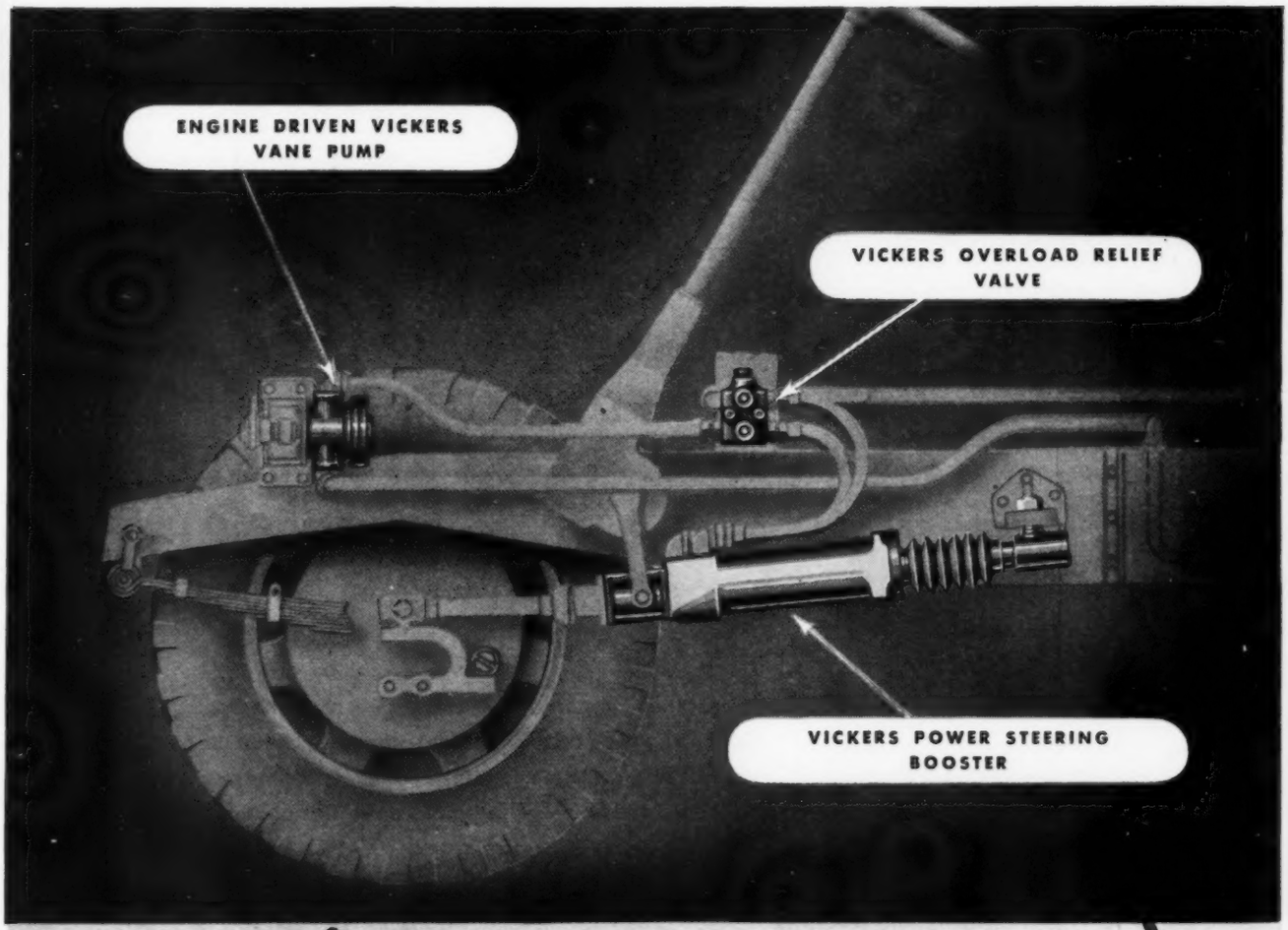
The hydraulic power cylinder is connected to the drag link at one end and the chassis frame at the other; it is controlled by the pitman arm. The existing steering gear is not altered. Hence, Vickers Power Hydraulic Steering is easily applied either as original or as optional equipment.

Steering is finger-tip easy—instantly responsive—and no road shocks can get to the steering wheel. Overload protection and lubrication are both automatic. Fifteen years of successful operation on trucks, buses, and road machines have proved the value of Vickers Power Hydraulic Steering. Write for Bulletin 44-30.

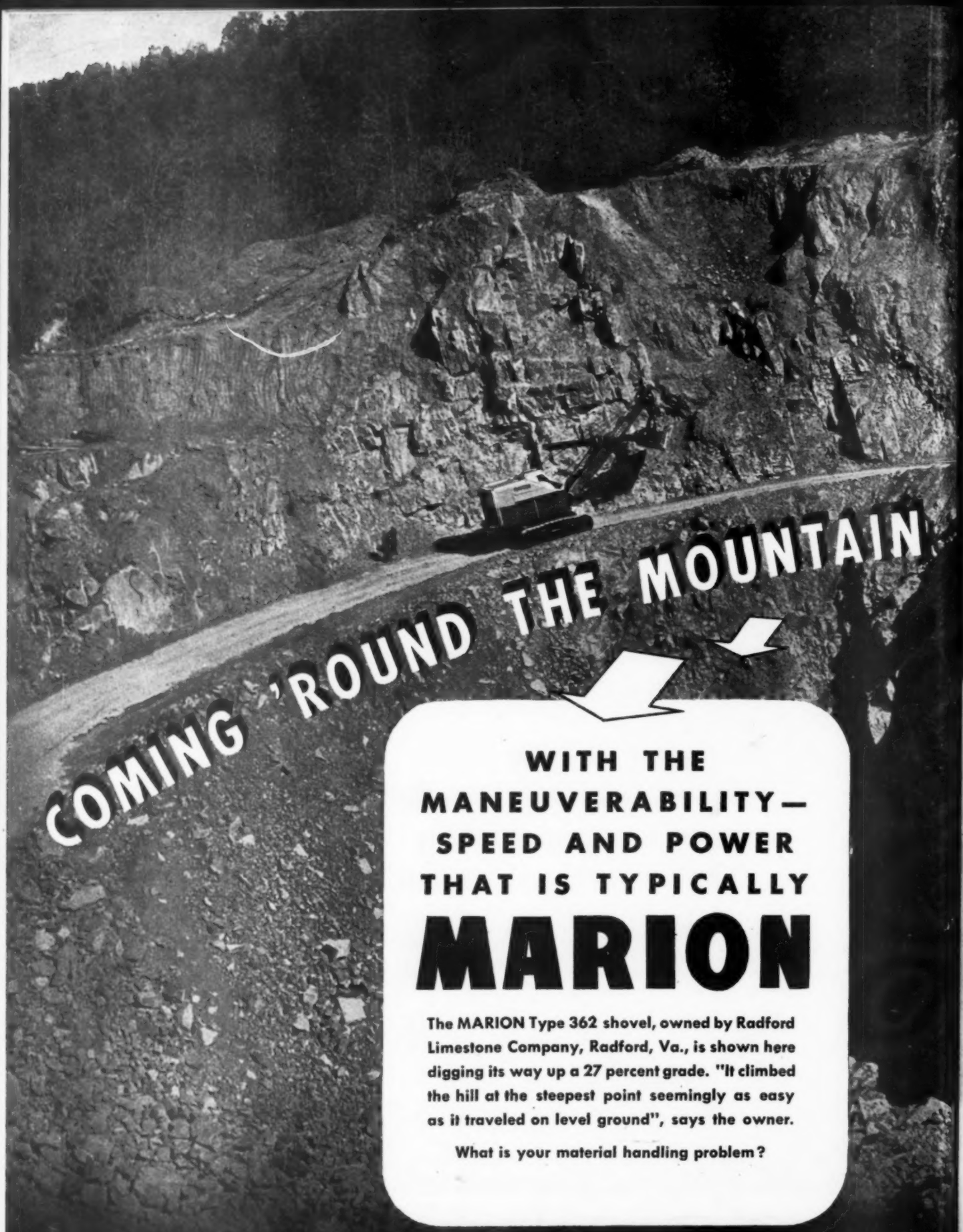
VICKERS *Incorporated*

1432 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices: CHICAGO • CINCINNATI • CLEVELAND DETROIT • LOS ANGELES • NEWARK • PHILADELPHIA • ROCHESTER ROCKFORD • TULSA • WORCESTER



REPRESENTATIVE APPLICATIONS OF VICKERS HYDRAULIC POWER STEERING



WITH THE MANEUVERABILITY— SPEED AND POWER THAT IS TYPICALLY

MARION

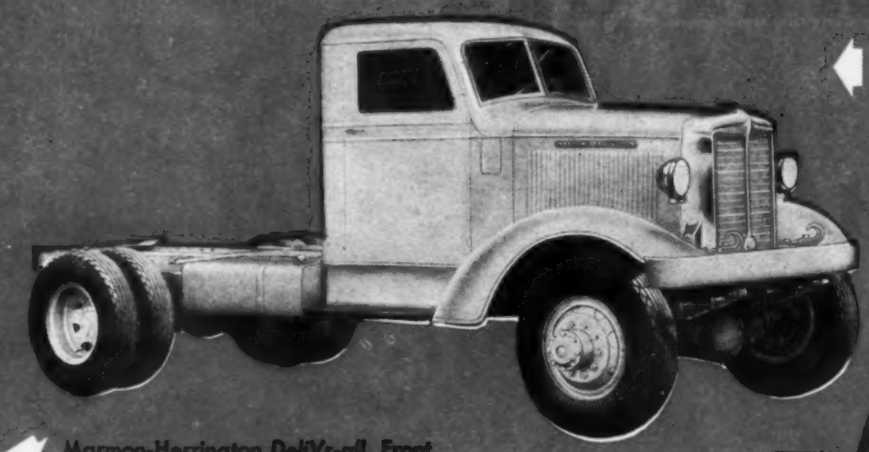
The MARION Type 362 shovel, owned by Radford Limestone Company, Radford, Va., is shown here digging its way up a 27 percent grade. "It climbed the hill at the steepest point seemingly as easy as it traveled on level ground", says the owner.

What is your material handling problem?

THE MARION STEAM SHOVEL COMPANY

Marion, Ohio

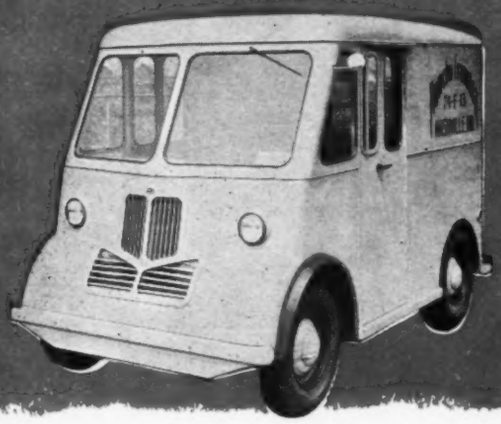
From ¾ cu. to 40 cu. yds. • Offices and Warehouses in Principal Cities



Marmon-Herrington Heavy Duty *All-Wheel-Drive* truck. Gross capacities up to 27,000 lbs.

All standard Ford trucks converted to Marmon-Herrington *All-Wheel-Drive*.

Marmon-Herrington *DeliVr-all*. Front wheel drive home delivery truck.



THREE GREAT TRUCKS FOR

POSTWAR'S BIGGEST TRUCKING JOBS

● For 1946, Marmon-Herrington offers three outstanding lines of vehicles for every trucking need.

Back again are Marmon-Herrington's famous Heavy-Duty *All-Wheel-Drive* Trucks, and Marmon-Herrington *All-Wheel-Drive* converted Fords—all importantly improved to deliver better-than-ever on- and off-the-road performance. Built to give you great power and traction—*when you want it—where you want it*—Marmon-Herrington *All-Wheel-Drive* Trucks are tops for tough assignments on road construction and maintenance, snow removal, oil field service, mining, logging, public utility work, etc.

For stop-and-go delivery service, there is Marmon-Herrington's unique new *DeliVr-all*. Entirely new in principle, *DeliVr-all* offers a host of long-awaited advantages—wide, close-to-the-ground floor (for easy entrance and exit)—large capacity—low center of gravity of load—stand-up or sit-down operation—short wheelbase maneuverability—independent and detachable front-end power and drive unit—and many others.

Discover how these new Marmon-Herrington Trucks will speed operations—reduce costs—increase profits . . . *for you!* Write for descriptive literature.

HEAVY-DUTY ALL-WHEEL-DRIVE TRUCKS
Four-Wheel-Drive or Six-Wheel-Drive

All-Wheel-Drive CONVERTED FORDS
World's Best Values for On-and-Off Highway Service

DELIVR-ALL
Sensational, New Home-Delivery Truck

MARMON-HERRINGTON COMPANY, INC.
Indianapolis 7, Indiana
Cable Address: MARTON

MARMON-HERRINGTON TRUCKS

MORE POWER and REAL STRENGTH *Here—*

Mean Continuous Operation and Longer Lif

on the job—

No Adnun Blacktop Paver wa ever a "one-job" machine . . . some of the oldest models are still paving—and the new, faster and more powerful Adnuns are built to take the shocks and strains of high production paving without structural or power failures that hold up paving—make cheap equipment an expensive investment in the long run. Adnun construction puts strength where it is needed in a heavy, cross-braced frame; provides insurance against out-of-line drive elements; and gives you the power to handle th heaviest trucks efficiently on any normal high way grades.

Adnun "Feathertouch" Hydraulic Controls Power Cut-Off, Four-Wheel Drive, Continuou Course Correction, and versatility in paving t specifications under any job conditions at features that help to make long, dependabl Adnun service *profitable* service for you.

There is a complete new catalog on Adnu Blacktop Pavers ready to be mailed at you request. Write for it today.

THE FOOTE COMPANY, Inc.

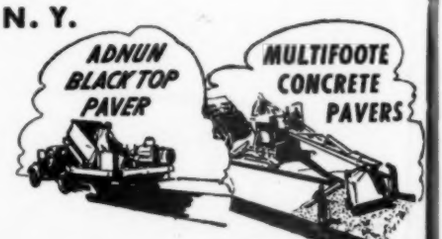
1936 State Street • Nunda, N. Y.

Three Army-Navy "E" Awards for The Foote Company!

ADNUN

TRADE MARK REGISTERED

BLACK TOP PAVER



DON'T GIVE SNOW A CHANCE!

- **Hit it FAST**
- **Throw it FAR**
- **Do a CLEANER JOB**

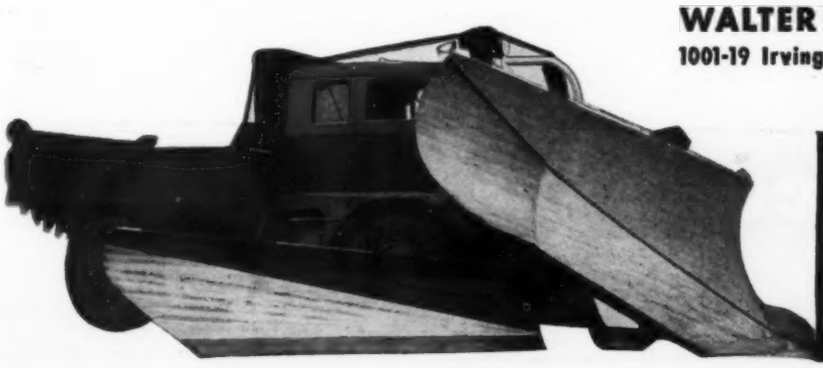
with WALTER SNOW FIGHTERS

Once snow forms into hard banks, deep drifts and icy ruts, you're in trouble! Surest way to avoid these hazards is to keep *ahead* of the storm with Walter Snow Fighters. They clear 28 ft. lanes at speeds up to 30 m.p.h. This high speed clearing throws snow far off the road—leaves less snow to handle on subsequent runs—makes widening out, cleaning up and pavement scraping much easier.

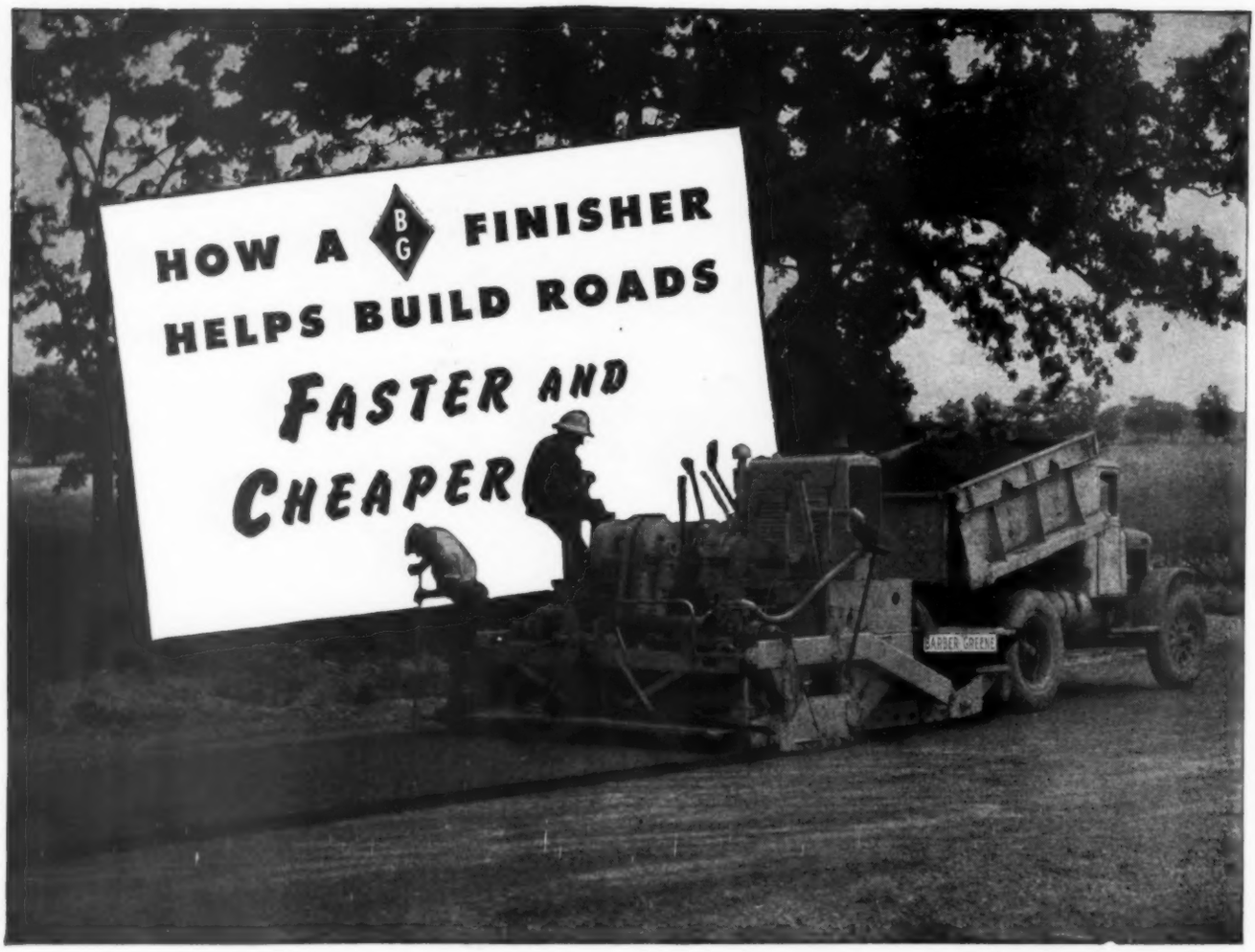
Such sustained high speed clearance is possible *only* with Walter Snow Fighters because of the 100% traction provided by the Four Point Positive Drive. There is no wheel spinning, slipping or stalling on snow or icy surfaces. Steady tractive power is available at all times.

Walter Snow Fighters have greater clearing capacity, thus fewer units do a more effective job, cutting your equipment, maintenance and snow removal costs. Have one of our snow removal experts discuss your needs. Write for detailed literature today.

WALTER MOTOR TRUCK COMPANY
1001-19 Irving Avenue, Ridgewood 27, Queens, L. I., N. Y.



WALTER SNOW FIGHTERS



• Here's a machine that performs three jobs at once. And you can keep it moving steadily—all day long. In rapid succession, truckloads of asphalt mix are mechanically spread . . . "kneaded" and thoroughly *tamped* in place . . . and automatically leveled—all in one operation.

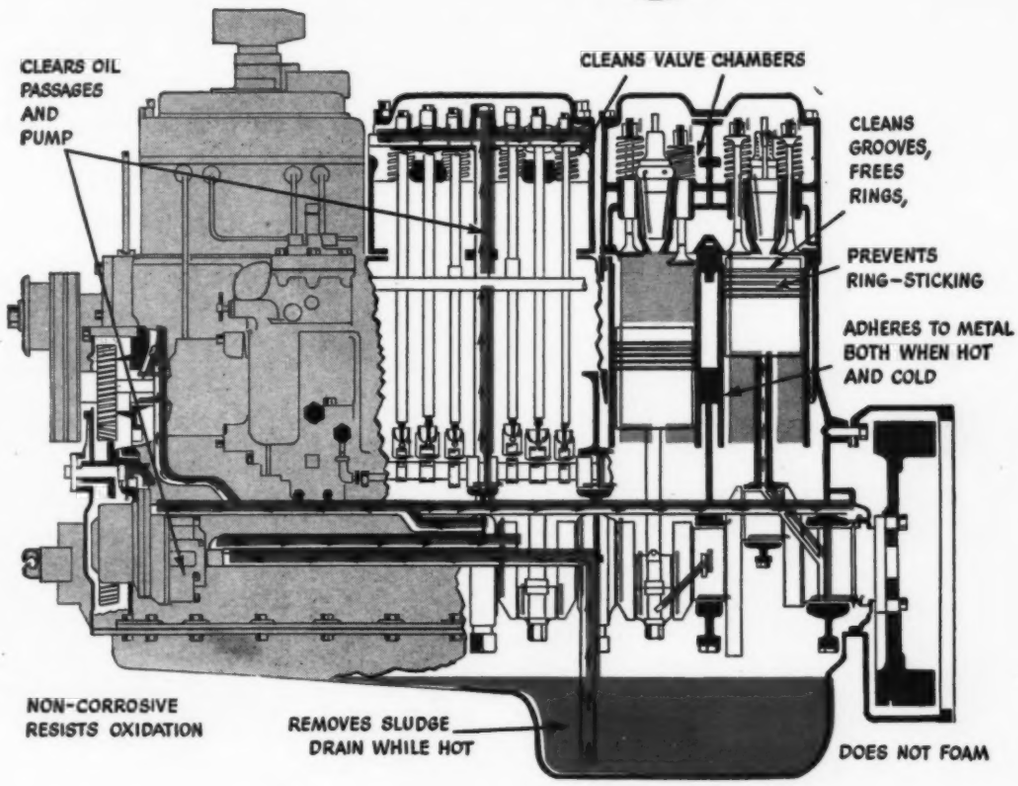
Moreover, the Barber-Greene Tamping-Leveling Finisher helps provide fast, cheap road construction by reducing the amount of rolling for adequate compaction . . . eliminating hand labor behind the machine . . . decreasing truck delay . . . cutting out the hazards encountered in other methods.

You'll find that a B-G Finisher saves days and dollars on every black top paving job. It handles mixes extremely difficult or impossible to lay by other means . . . maintains a mat of uniform thickness, ranging from ¼-inch to 6 inches . . . holds an accurate crown . . . and tightly seals joints with adjacent strips.

Before the call comes for the hurry-up resurfacing of worn-out highways, and the speedy construction of new roads and airports, plan to add a B-G *Tamping-Leveling* Finisher to your equipment. Write for literature outlining the functions and performance of this versatile machine. Barber-Greene Company, Aurora, Illinois.

Barber-Greene B G *Constant Flow Equipment*

STANDARD ENGINEERS NOTEBOOK


CLEARS OIL PASSAGES AND PUMP
CLEANS VALVE CHAMBERS
CLEANS GROOVES, FREES RINGS,
PREVENTS RING-STICKING
ADHERES TO METAL BOTH WHEN HOT AND COLD
NON-CORROSIVE RESISTS OXIDATION
REMOVES SLUDGE DRAIN WHILE HOT
DOES NOT FOAM

Heavy duty oil cleans engines while they're running

Clean carbon, sludge, gum and other harmful matter from heavy truck engines without tearing them down by purging with RPM Heavy Duty Motor Oil.

It will even loosen stuck rings if they are not cemented in too tightly with accumulations of sticky, burned-on gum.

Selected base oils plus patented compounds give RPM Heavy Duty Motor Oil the ability to act on and remove carbonaceous deposits and keep them dispersed in the oil so they can be drained from the engine. The recommended purging procedure follows:

1. Drain present oil from crankcase while hot. 2. Renew filter element to trap abrasive particles that may be carried into circulation during purging. 3. Fill crankcase with RPM Heavy Duty Motor Oil. 4. Run engine at a fast idle for two hours, maintaining water jacket temperature of approximately 200° minimum. 5. Drain again while hot and refill with RPM Heavy Duty Motor Oil. 6. Place engine in regular service and drain at one-half normal drain period or 750 miles, whichever comes first, for two or three drains. Check oil frequently as removal of deposits may temporarily increase oil consumption. 7. Drain while hot. Check oil filter and replace when necessary. 8. Refill with RPM Heavy Duty Motor Oil, returning to regular oil drain and filter change period, and continue to use RPM Heavy Duty Motor Oil.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif., or California Commercial Company, 30 Rockefeller Plaza, New York 20, N. Y.

FOR EVERY JOB A **STANDARD OF CALIFORNIA** TEST-PROVED PRODUCT

When there's a man-size job to be done...

This 15-ton Mack is working proudly in front of the Grand Coulee, world's largest concrete dam, located on the Columbia River in the Northwest United States. The Grand Coulee was nine years in the building, and a fleet of Macks, such as this one, were in on the job *all the way*. Records too numerous to mention testify to the manner in which giant Mack trucks handle the world's toughest construction jobs. Contractors know from experience that Macks stand up *longest* under the *hardest* operating conditions. And the reason:—Macks have been so built that they have gloried in *super*-hard work for nearly half a century!

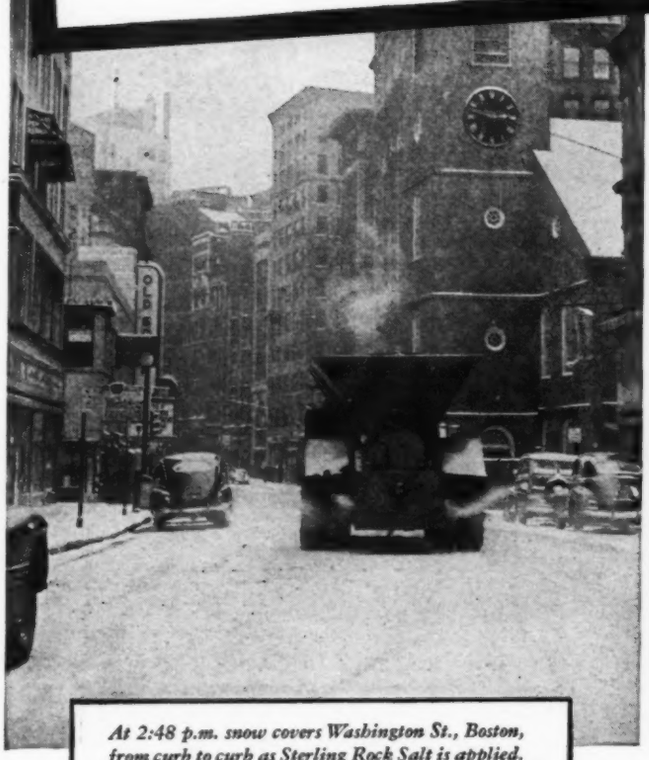
Mack
TRUCKS
FOR EVERY PURPOSE
ONE TON TO FORTY-FIVE TONS

Performance Counts

★ **BUY THAT VICTORY BOND TODAY** ★

Mack Trucks, Inc., Empire State Building, New York 1, N. Y. Factories at Allentown, Pa.; Plainfield, N. J.; New Brunswick, N. J.; Long Island City, N. Y. Factory branches and dealers in all principal cities for service and parts.

To Remove Snow and Ice—They "PASS the SALT"



At 2:48 p.m. snow covers Washington St., Boston, from curb to curb as Sterling Rock Salt is applied.

At approximately 3 p.m.—less than 12 minutes later —snow is mealy slush that will quickly vanish.

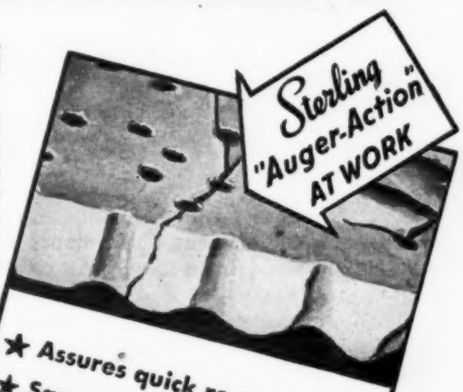
SNOW-CLOGGED highways and ice-glazed streets this winter offer public officials two choices:

"Treating" the snow or ice with abrasives . . . consuming much time, labor and equipment, and accomplishing only temporary results.

OR—*quick and effective removal of such wintry hazards . . . with Sterling Rock Salt!*

Spread when a storm strikes, Sterling Rock Salt prevents sleet and snow from bonding . . . keeps it mealy and easily whipped off to the sides by traffic action.

When snow is packed and ice is formed . . . Sterling "Auger-Action" Rock Salt bores through the largest masses . . . forms a brine which loosens the bond with the pavement . . . the shattered chunks broken by passing traffic are easily removed . . . the remaining brine will prevent any further formation of ice.



★ Assures quick removal
★ Saves labor and equipment
★ Makes driving safe

Sterling
Auger-Action
ROCK SALT

Get the full facts in new FREE booklet!

INTERNATIONAL SALT CO., INC.
Dept. RS-1, Scranton, Pa.

To do an efficient *removal* job with utmost economy . . . just fill in this coupon and mail it today for your *free* copy of "WHY, WHEN AND HOW TO APPLY STERLING 'AUGER-ACTION' ROCK SALT."

*Name*_____
*Title*_____
*Street*_____
*City*_____ *Stat.*_____

INTERNATIONAL SALT COMPANY, INC. • SCRANTON, PA.

GET MORE POWER FROM YOUR ENGINES

U. S. Army Air Forces Photo

Use this . . . DETERGENT DISPERSIVE . . . Oil

FOR efficient performance under all conditions, from tropic heat to arctic cold, heavy-duty gasoline and Diesel engines need an oil that keeps engine parts clean, rings free, assures better compression, better combustion. *Texaco Ursa Oil X*** fills the bill precisely. It's both detergent and dispersive. It assures full power output, with greater fuel economy.

The properties of detergency and dispersion in *Ursa X*** play a major part in producing these benefits. Detergency keeps your engine clean. Dispersion holds deposit-forming materials in suspension until drained. In addition, *Texaco Ursa Oil X*** has properties that protect bearings against corrosion, prevent scuffing of rings, pistons and cylinders.

For effective lubrication of air compressors, use *Texaco Alcaid, Algol or Ursa Oil.* You'll assure wide-opening, tight-shutting valves, eliminate ring-sticking, reduce repair and replacement bills—get better performance at lower cost.

Put your lubricating problems up to Texaco Lubrication Engineering Service. Call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Lubricants and Fuels

FOR ALL CONTRACTORS' EQUIPMENT

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

ROADS AND STREETS

JANUARY, 1946 • VOL. 89 • No. 1

Contractors and Engineers Attend Soil Compaction Conference

Need for standardization of tests, and for more trained inspectors and testing personnel, questions introduced by vibratory rollers, among problems highlighted in two-day meeting of ARBA committee at Washington, D. C.

MODERN soil compaction methods which permit rapid construction of highways and airports with stable subgrades and embankments, were the subject of a recent conference of fifty representative soils engineers and scientists. This meeting, held at Washington, November 15-16, was under the auspices of the Soil Compaction Committee of the American Road Builders' Association. Earl F. Bennett, principal soils engineer of the New York department of public works, is chairman. [See Nov. R&S for editorial comment on this meeting.]

The meeting is the first of several to be held soon by various A.R.B.A. technical committees under the general chairmanship of H. F. Clemmer, engineer of materials, D. of C. highway department, each to deal with some phase of highway or airport building. This meeting had an immediate purpose of paving the way for a series of papers on soil compaction at the coming A.R.B.A. Annual Meeting, January 14-17, in Chicago. Discussions were led by G. W. McAlpin, Civil Aeronautics Administration; T. L. Shelburne, director of research, highway department of Virginia; L. D. Hicks, soils engineer, N. Carolina highway department, and J. C. Aldrich, Seaman Motors, Milwaukee.

"Why Should We Compact?"

"Nothing else the roadbuilder or airport builder can do is so cheap and so effective as subgrade compaction, as a means of getting load carrying capacity and durability. Compaction of subgrades often increases bearing capacity as much as 150%."

One conference session each was held on advancement in theory; procedures for spreading, moisture control, rolling and density control; compaction specifications and contract inspection; and equipment. The discussion details were so pointed and timely that the "Roads and Streets" editors deem it worthwhile to present the following detailed excerpts. A more complete official report will undoubtedly be issued later by the Committee.

Fundamental Problems

Chairman G. W. McAlpin "paced" the first session by observing that about all we know "for sure" about soil compaction are these two things: the basic relationship between moisture, density and compactive effort; and the fact that by increasing effort, moisture content is decreased and density increased. He cited the three general explanations which have been advanced for the nature of the optimum density curve, namely, the "lubrication" theory advanced by Proctor, involving hydrostatic pressure; the "film" theory credited to C. A. Hogentogler, Jr., in which consideration is given to water film surrounding soil particles and adhesion as related to film thickness; and the theory of surface tension of water, not too fully explained to date.

The fundamental question of "why we compact" spotlighted several basic conclusions, namely, that increased soil density means less moisture content at saturation; increased density also results in a decrease in permeability by reducing site of pores, and in less settlement because there are fewer voids and less moisture.

The need to obtain a correlation between standard and modified AASHO density tests was empasized by one authority, who has seen this need especially in connection with recent density tests on soils containing admixtures. Also needed is a correlation between different laboratories on control limits in compaction tests. Greater precision of control must be exercised than commonly prevails, to insure the compaction needed for modern highways and airports.

Greater Densities Sought

Further interesting miscellaneous points brought out:

1. It is important to obtain maximum compaction, whatever the soil, and laboratory studies are needed as basis for promoting a program of field experimentation. The question was raised as to whether higher densities should be sought than are now obtainable with standard effort, which would require some new modified compactive effort. Airfield construction agencies have led the way in this direction. A spokesman for the Civil

Aeronautics Administration urged greater attention to modified AASHO density requirements and more emphasis on density. He also observed that the poorer the soil the more rigid the specificatons must be to obviate slides in high fills.

2. There is no truly waterproof pavement; infiltration must be anticipated. Also that capillarity affects the problem of maintaining initial load capacity, and this again points to need for securing greatest campaction possible.

3. Most contractors have not had experience under Proctor control, and the great deal of trouble experienced in getting compliance from the contractor's organization. An educational program among contractors is needed. In fact, the basic value of compaction as well as latest methods and equipment need to be sold to officials, engineers and contractors generally.

While undoubtedly contractors must improve their knowledge of compaction methods and give fuller cooperation, the real job is to get better teamwork between all parties—field engineers, test men, equipment manufacturers, and contractor's force.

Test Experiences

4. The U. S. Engineers were reported to have made numerous compaction tests using the CBR to correlate shear strength of soils with other properties.

5. Inaccuracies of CBR values on the wet side of optimum were cited; also the evidence of compacted subgrades which have become still more consolidated under heavy bomber traffic, but with resultant increases in water content and decrease in the CBR.

6. The tendency of loss, in density under natural subgrade conditions of alternate wetting and drying was reported for several airfields in the South.

7. The criterion of quality is not the density but the **structure** of the soil, including absorbed moisture film.

8. Increased strengths were found where compaction was secured 2% to 3% on the dry side of optimum. Care must be exercised however not to get too far on the dry side, or strengths will increase rapidly.

Long experience has shown that subgrade strengths must be obtained that will not allow settlements greater than the low strains permissible in a pavement. The U. S. Engineers, it was said, want compaction of 100% or more of modified AASHO on future major projects.

9. The war department is currently interested in increased compaction for big planes. At one airfield, "100% of the compaction obtainable" was specified for top lifts, plus 95% Proctor to depth of at least 5 ft.

10. On the problem of the disruptive effect of heavy construction equipment: the engineer should know what loads will disrupt the top layer of a compacted sub-grade, and the contractor elect whether to avoid passing heavy equipment over certain areas or re-construct such areas at his own expense.

Ideas on Moisture Control

On moisture control: Tendency was noted of overrating the importance of moisture control, instead of concentrating on the task of getting compaction. A more rigid specification on moisture control, as advocated in discussion, might not be worth the cost. Most specifications for stabilization compaction allow 2% moisture tolerance from optimum, while moisture present may vary as much as 20% to 28% for a silt and clay soil or as little as 8% or 9% for granular soils.

The problem in soil-cement processing is often to get **enough** moisture to properly hydrate the cement. The prevailing problem in the east on grading work in 1945 however, was to **reduce** moisture. Repeated emphasis was put on the importance of keeping fills and borrow pits well crowned, free of ruts and properly dressed each night at quitting time to shed rain with least absorption. A CAA engineer observed that it may be cheaper to use some type of drying-out procedure than to keep sheepsfoot rollers passing back and forth for an hour.

Contractors Want More Definite Specifications?

A representative for a large contracting firm made a plea for more definite specification of moisture tolerance, saying that it would help contractors get a desired density more economically. Excessive compactive effort has been necessary on projects where not enough field control of water in soil was provided. He preferred that water be made a separate bid item, and said it would also be worth while to specify the number of roller passes. With such complete specifications, there'll be less of a spread in bids.

Another contractor's engineer double-checked these thoughts, adding that the biggest problem is in figuring a job, since the contractor must deliver a specified result and usually cannot get enough of a line on conditions in advance.

In rebuttal, it was observed by one engineer that specification of method of procedure in too much detail would tend to stagnate both equipment advance and contractor initiative. The great recent progress in compaction methods is due to efforts to get a specified result. Specification of strict methods would discourage low bids from contractors who have short-cut methods up their sleeves. The correct procedure for compaction varies with nearly every job, anyway.

One engineer in this discussion took the middle ground that we must continue to specify some procedure, but that it will help to break down the pay items more, into placing material, water and rolling instead of one price complete on place per cubic yard.

U. S. engineer practice sometimes has been to specify the thickness of layers, roller types and pressures, and number of passes, in order to give contractors a basis for bidding—and then pay extra for additional passes required. A definite procedure helps in setting up a time schedule.

Rock Fill Questions

Proper thickness of layers and other phases of rock fill practice were discussed. The chief problem was seen usually to be that of properly filling large rock voids with finer materials to obtain rollable lifts and avoid subsequent settlement.

Proper preparation of ground under rock fill is highly important, to avoid subsidence or slippage. Unsatisfactory topsoil must be stripped, proper drain ditches established and benching provided. A lift of sand placed under high fills is good practice, and slope ratios should be designed as carefully as the compaction requirements.

A test fill will often be an economy on the contractor's part, to determine the number of passes, layer depth, equipment handling and other phases.

Ideal rock fill outfit on large jobs is built around a 2½-yd. shovel.

"Specs" and Inspection

An effort should be made to supplement field testing personnel with men from the headquarters laboratory at the start of an airport or large highway grading project, until the field testing men have perfected the routine.

How frequent compaction checks? CAA practice is to run 10 to 15 density tests daily on a 1,000 to 1,500 ft. runway section, staggering locations at different lifts. Another agency recommended a test for each 5,000 cu. yd. of loose material on grading work.

Can the compaction specifications be carried out? Is the intent clear? Vague or unduly severe wordings came for criticism; for example the expensive specification on a certain

very heavy military project which said, "Fills shall be compacted until no further compaction is possible."

North Carolina has a new procedure of submitting specifications to contractors and material men for opinions. Main thing is to have common sense rules, workable in the field. As a result of difficulty in obtaining standard AASHO density, now specifications in this state specify the number of roller trips (usually two per inch layer) of 12 per lift, a figure determined by studying soil-cement methods. But some soils won't take this rolling.

Roller details, i. e. weight and feet dimensions, are specified, but contractor can elect the type of roller. (Size of sheepsfoot feet is important, particularly in fine coastal sands, where feet having 18 sq. in. of surface compact well but a 9 sq. in. foot merely "scarifies."

More Test Men Needed

Specification of percentage of standard compaction is discouraged by the scarcity of experienced field engineers. Enforcement is a real problem today. There is a particular shortage of younger men with a year or so of college, mechanical aptitude and other assets for becoming good subgrade inspectors. Labor saving tricks of the trade, such as mathematical shortcuts, partial indicator tests, graphical projection methods, etc., need to be practiced more fully, but experienced men are needed to do this.

Speed and efficiency are important in performing field moisture and compaction tests in that they minimize tie-ups of the contractor's expensive outfit. Big, fast operators among the contractors need the support of plenty of good inspectors. Such specification clauses as "every layer shall be 95%" are hard to keep up with when 500 to 700 cu. yd. of dirt is being placed per hour on highway grade. Tests in reality should be done mainly as checks on inspector's judgment.

Vibratory Compaction

Recent studies of vibratory compaction equipment to determine hearing power of soils so compacted, were described by Prof. G. P. Tschebotarioff, Princeton University (made for C.A.A., these tests are described in the 1944 Proceedings, 24th Annual Meeting, Highway Research Board). Vibratory force has an enormous effect on deformation of sandy materials and in their compaction, but little effect on clays or sand-clays, he observed. The result depends on the combined factors of vibratory equipment and the materials employed, rather than on equipment characteristics alone. Vibration frequency or period has little to do; number of repetitions is the more important. Weight of the equipment has also proved to be a critical element. The depth of effect of vibration of granular soils needs further study.

Pressure Water Tanks

Sprinkling equipment should be designed to use pressure instead of gravity, to insure uniform, positive control of rate of application of moisture. Rigging gravity tanks with a 2-in. centrifugal force pump to put pressure on the stray bars was cited as successfully used in N. Carolina.

The vital part played by modern earth-moving, processing and compacting equipment was reviewed by J. Aldrich, Seaman Motors Inc., Milwaukee, chairman of the fourth session on equipment. The meeting revealed:

1. The importance of use of rotary mixers, cultivators or other means of thorough pulverization in stabilization work, especially in breaking up fine grain soils also.

2. Increasing use of stationary or traveling plants as a means of water incorporation. Such methods avoid the concentration of water that occurs in ruts when sprinklers are used.

3. Southwestern practice of windrowing wetted materials with a traveling plant and water tank accompanying; windrows hold moisture well, and drying out of the outer few inches is not serious.

4. Growing interest in pneumatic rolling, especially where fine grain sand soils are to be compacted in thin layers. Pneumatic rolling of the top layer serves to give kneading and locking, hold moisture and get excellent compaction.

(*Continued on page* 76)

H. K. Glidden Becomes Eastern Editor of "Roads and Streets"

THE Gillette Publishing Company, publisher of "Roads and Streets," is pleased to announce that H. K. Glidden, recently Assistant Superintendent of Airways in the New York office of the Civil Aeronautics Administration, has joined the paper's staff as Eastern Editor. He will make his office headquarters at 155 East 44th St., New York City, and will devote his time principally to covering engineering and construction activities on roads and streets, expressways, bridges, airports and heavy earth-moving projects in the eastern part of the country.

H. K. Glidden

Mr. Glidden is peculiarly well qualified by education and experience to assume the role of an engineering and construction editor. A graduate of the University of Kansas School of Engineering, he has supplemented his education by continuous and progressive experience in both the engineering and construction fields. Eight years in highway and earth dam construction provided him invaluable experience in this field. His more recent duties with the C.A.A. brought him into direct contact not only with airport engineering and construction problems, but also those involved in implementing airports with radio, traffic control and communications facilities. The 12 years during which he was an engineer for the C.A.A. and its predecessors, afforded him an exceptional opportunity to observe and study engineering and construction practices as they apply to airport and airway development. During this period he supervised engineering and construction of twenty-six airport projects, costing some fourteen million dollars.

Mr. Glidden is co-author of a text book which Harper and Bros. is now publishing entitled, "Airports: Design, Construction and Management." He is also the author of a number of technical and semi-technical articles which have appeared in magazines with national circulation. Several of his articles have appeared in "Roads and Streets," most notably the current series, continued in this issue, on engineer-contractor relationships..

EDITORIAL

★ Should Economy Always Govern?

We are indeed indebted to Mr. Worthington for the opportunity of publishing his frank ideas, in this issue, on the use and value of cost keeping. Road building is still a difficult art, in spite of scientific advances, mainly because of the judgment that must be exercised in deciding when and where to build and with what types of materials. There will never be an exact yardstick or slide rule answer to such questions—only a considered judgment based on cost data and practical experience. Nevertheless this article spotlights what seems to be a serious prevailing lack of cost information generally. As your editor travels about he constantly is shown or told how this or that project is designed and built, but only the most persistent sleuthing ever brings out the other half of the complete engineering story: what the project finally costs to build, maintain and use.

No better administration suggestion can be made to road builders than that they resolve to keep and use more complete cost records as a double check on their judgment. Nothing less will fulfil the duty to taxpayers.

★ Delay on Needed Projects Costly

How long are road and street officials justified in delaying contract awards because of current high bids?

Elsewhere in this issue, Mr. Upham presents data showing that the current bids are not too far above the 1921-29 price index average to be cause for alarm. Far more costly than an additional 25 or 30% in award price is the cost of delay in the relief that new expressways will bring in our cities. Infinitely bigger than the first cost of a quick start on rural road rehabilitation is the stake that farmers, livestock shippers, small town citizens and the public generally have in efficient highway transportation.

A nation that lives and breathes by virtue of billions of ton-miles of rural highway trucking is interested in just one thing: get going!

Every highway leader and every highway engineer and worker has a responsibility to keep selling the basic need for the commodity he helps provide, which is highway transportation. A great service is being rendered, for example, by such utterances as that made recently by C. H. Purcell, California director of public works, at a public gathering. In pointing to the vital need for a complete and speedy revamping of his state's highways, he pointed out two opposing facts:

One: Bigger and better traffic volumes are ahead. Traffic on the California state highway system by last October had come back until it was 10% heavier than in October, 1941. And that with fewer cars, before many new autos or trucks had hit the road.

Two: There is a huge accumulated need for better highway facilities. Road building deficiencies accumulated for a year before the war until his state was $450,000,000 behind in its job. The war years swelled the deficiency to $695,000,000. Critical deficiencies include weak or narrow bridges, structurally weak roadbeds, inadequate traffic capacities, specific hazard or obstruction points, lack of freeways through and between major cities.

In the months ahead we'll all be engrossed in the problem of getting going on postwar programs. The first need is to hasten the start, even at considerable price increases. But behind the scene is always the need to keep selling our wares, and in terms that the public will understand and approve. Manpower shortage? Yes, for now. But even with the unprecedented size of Federal highway appropriations and state, urban and local matching requirements, who knows but what even larger funds will eventually be needed to keep pace.

★ Don't Overload Your Equipment

We don't take much stock in formal personal resolutions, but a visit to a large eastern job recently has lead us to suggest a very good one: I hereby resolve to see that my equipment isn't overloaded.

Often during the war there was a reason for heaping the dirt high and sending trucks away staggering under overloads, loads at any cost to rush the job. But that reason is now passed. Owners who have large investments in scrapers, trailers, trucks, and other costly equipment will find it a good business to instruct the men to hold to manufacturers' recommendations.

One of the common fallacies is that a truck or other unit can be heaped as high as the load will go, regardless of the kind of material. But there is a big difference in the unit weights of various shovel and pan materials. It is mighty easy for an outfit to habitually overload 25% or more, and thus give lots of nice work for the shop boys in overhauling engines, transmissions and axles, welding busted frames, etc.

9½ Million Yard

Airport Grading Job Moves Into Second Year

Camera and notebook glimpses of Harrison Construction Company's grading job at Kanawha County Airport, Charleston, W. Va.

By Harold J. McKeever
Editor, ROADS AND STREETS

SINCE the Editor first visited this huge hill-leveling project early last summer [see July R&S for comprehensive article], Harrison Construction Company, Inc., of Pittsburgh, was awarded the third runway. This raised their yardage from 5½ million to 9½ million cubic yards, and assured them a good two years' run here. This company, it can be told now, had a 9-million-yard earth moving job at the Oak Ridge atomic bomb plant in Tennessee, and much of this outfit came direct from there.

My second visit, in November, found the 200-machine outfit beginning its second year of the project. During the first 230 operating days Harrison had experienced 33 days of "rain; no work," 85 days of "rain; partial work," and 116 days when some rain fell. In spite of this, and in spite of some labor trouble and a continued lack of shovels and certain parts, the contractor had moved about 4 million yards. Biggest month was October, with 633,000 cu. yd. Biggest day, 22,000 cu. yds., mostly in one shift.

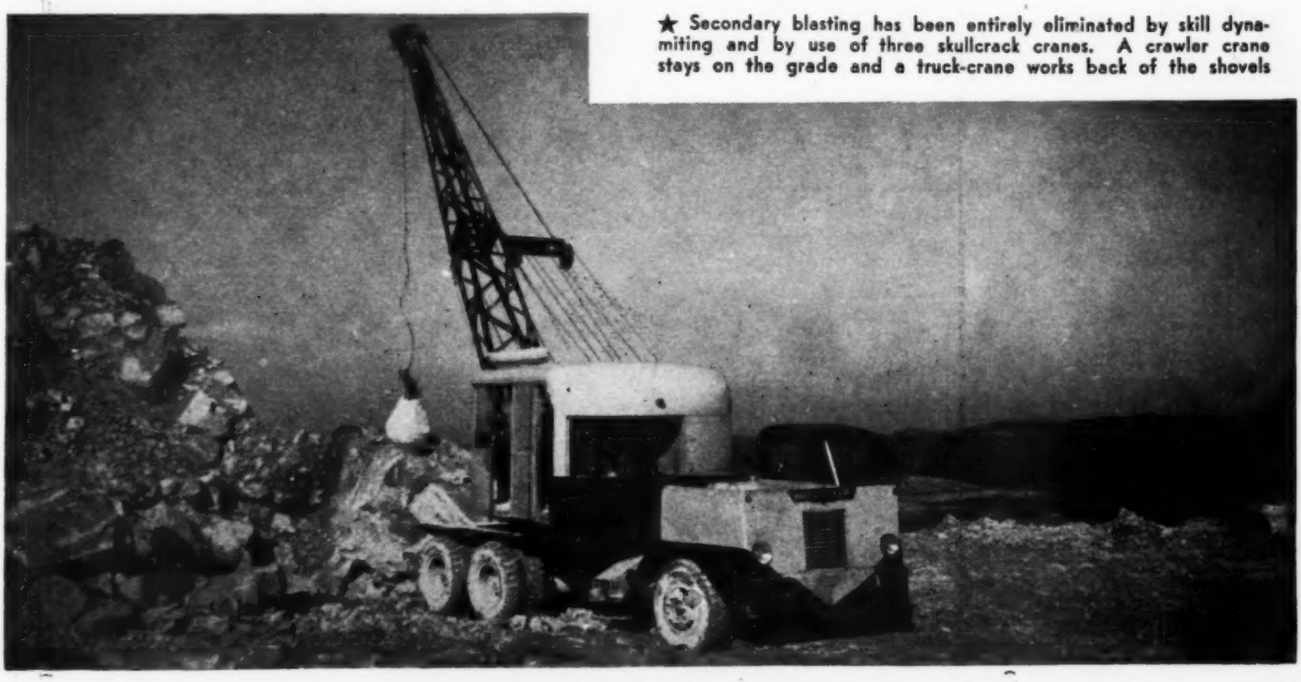
In September, as soon as the third or diagonal runway was decided on and awarded, Harrison began concentrating on building up the toes of ravine slopes involved.

Following are a number of random points of interest on the way this job is moving along:

1. The fill material (40% rock), represents a bulking of about 10% over undisturbed excavation material. This is with a compaction that is regularly checking 95% modified Proctor.

2. The eight shovels (1½ to 2½ yd.) have averaged 1,200 cu. yd. per 8-hour day per shovel. Shovels have loaded to 12-yd. rear dumps, bottom-dump trailer wagons, and lately to several "6-wheeler" side dump trucks of 25-30-ton capacity (20 yd. struck measure).

3. Lack of shovels has held back the scrapers, which are moving the biggest part of the job. Even with some of the available shovels on night work, the pans catch up and get ahead of shovels. However, about 12,000 cu. yd. per 8-hour day was being moved by the scraper fleet, consisting of twenty-one 12-15 yd. tractor-drawn units, twelve 22-25 yd. tractor-drawn scrapers, and six large self-powered scrapers. The latter (16-yd. heaped) were averaging 80 loads apiece on hauls that roughly averaged 1500 to 1800 ft. Haul grades, while still steep, are mostly now held to 8 or 10%, whereas 18% grades were needed in the early phase of ravine-filling. Hills being cut down



★ Secondary blasting has been entirely eliminated by skill dynamiting and by use of three skullcrack cranes. A crawler crane stays on the grade and a truck-crane works back of the shovels

★ At left, the highest fill (209 ft.) as it looked when one-third completed in June, 1945; at right, the same fill some 60 ft. higher in November

★ Eight shovels have averaged 1200 cu. yds. each daily

★ At day's end, truck beds up and ready for the grease wagon

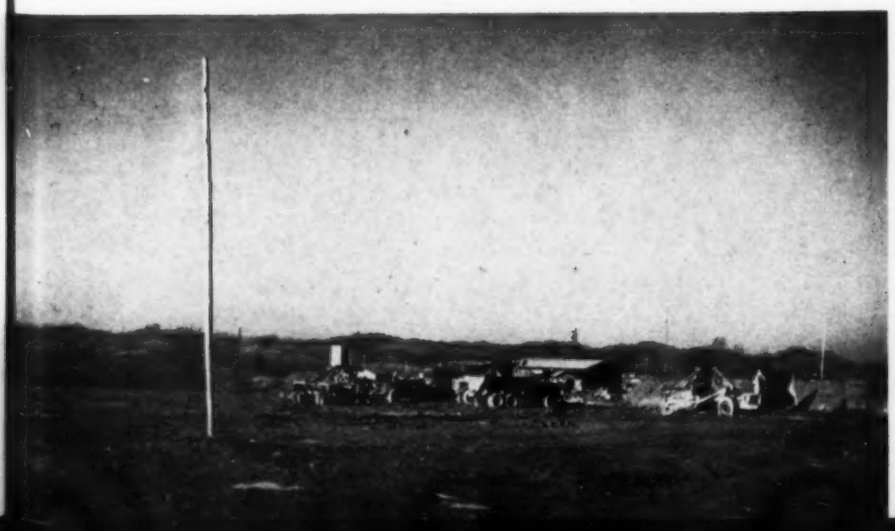
★ (Opposite page): Totem pole? No, just an extra tall "stake," one of several 30-ft. poles at grade stake locations, set to guide equipment operators along the right travel path

★ One of Harrison's two field shop buildings, where 40 mechanics and welders have labored to keep equipment going. Note the soft yard, which has had to be repaved with stone every month or two

★ Six of these big 20-yd. side-dumping "six wheelers" were brought from out west

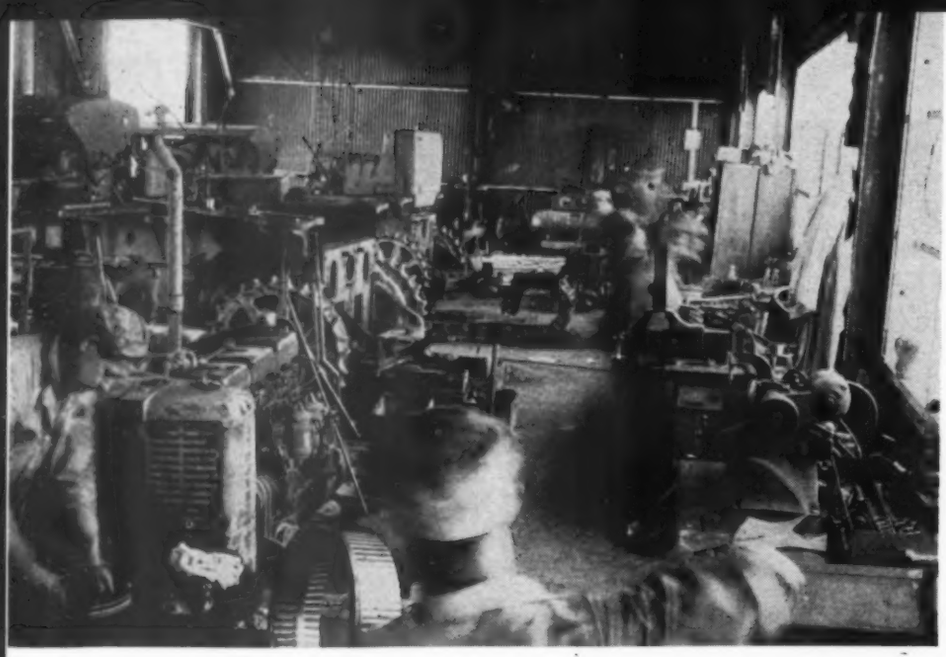
★ Not recommended, but Harrison's men decided to do it. When a rock became wedged in the bed of this bottom-dump trailer, a skull cracker came to the rescue

★ Safety campaign never flags on Harrison's jobs



PICTURE OF THE MONTH

★ **How Harrison Construction Company's 9½-million-yard airport grading job at Kanawha County Airport, Charleston, W. Va., appeared from the air last October, after a year's work. Four hundred acres chewed up, 4 million yards moved, on a 3-runway project involving 209 ft. maximum fill and 442 ft. maximum difference in elevation between excavation and fill. (See comprehensive article, July, 1945, "Roads and Streets"; also supplementary article in this issue.) Other cities must speed plans for construction or expansion of airfields**



★ Interior of the main field shop

★ Shop-built tool for use with sledge in driving or removing tight axles, bushings, etc.

have alternate rock, shale and clay strata, and a balance between pans and shovel output is essential to good mixing for the 2-ft. lifts in the fills.

4. A shortage of A-1 experienced operators continues.

5. Practically all drilling for blasting continues to be done horizontally, through shale. Drill holes are commonly carried about 75 ft. into the ledge, as against 45 ft. at first. One recent typical blast involved 21 holes at 15-ft. spacing.

6. Safety on the job is a never-ending campaign here. The Harrison firm has posted numerous warning signs against falling stones. See photo for one such sign. Another sign reads:

"Riding on running board, cab roof, hood or fender will not be permitted. Riders must be seated inside truck or equipment."

7. The field shops have again proved to be the focal point of the company's operation. Hundreds of overhaul jobs have been turned out by the repairmen, which currently number some forty.

A lesson is observed in the trouble the Harrison firm has had in maintaining a good shop yard. During the first 12 months the crushed-stone yard was chewed up and repaired ten times. In some instances during very rainy periods the stone would quickly disappear into the mud, the whole level of the yard becoming lowered two to four feet, under the combined sluicing action of scrapers, trucks and tractors, and from washing during rains. At the time of your Editor's visit in November, equipment had to climb into the repair doors from a 3-ft. trough in front of the main shop. (This money-eating, time-losing condition has been aggravated by the existence of an impervious ledge immediately under the leveled clay ground chosen for the yard).

★ Replacing brake lining with a power drill —one of the many labor-saving shop tools used by Harrison

8. Morale is high among Harrison's men. They like the outfit, which denotes skillful management. Reflecting the thought given to making the men feel like they're part of the organization, the company publishes a peppy, mimeographed illustrated monthly bulletin full of news about employees and employees in military service.

Fred Alley is Airport Director for the Kanawha County Airport, which began as a county-financed project. The second contract for the additional runway is under the Civil Aeronautics Administration, construction agency for the federally-financed portion, William Hawkins, resident engineer.

L. S. Westcott and R. Truzzie are respectively the engineer and superintendent for Harrison Construction Company with Martin W. Wise general superintendent.

▼

(*Continued from page* 69)

5. Successful use (North Carolina) of rotary tillers and blades for uniform moistening of sand in coastal sand dune region, so that it will support heavy tractor-drawn equipment for subsequent soil-cement processing with the same equipment.

6. Use of road-mix or traveling plant equipment as a central batch-haul plant where extremely bad subgrade conditions are encountered.

Road Convention Review and Construction Forecast Issue

The February issue of "Roads and Streets" will be devoted largely to a review of the American Road Builders' Association's recent annual meeting. It will include a summary of the many excellent papers and conference discussions and publication in full of several of the more important papers. This issue will also carry a summary of prospective 1946 construction as forecast by the 48 state highway departments.

Rebuild Engineering

MANPOWER!

—first need in new road building era, which must of necessity involve higher engineer salaries and higher construction costs, observes this authority. Excerpts from a paper given before the Southeastern Assn. of State Highway Officials at Atlanta

By Charles M. Upham
Engineer-Director
American Road Builders' Association
Washington, D. C.

WE ARE only partially prepared for this new era of road building.

Federal legislation has been passed, and federal money available. Most of the states have sufficient funds to finance their first year's program. There are sufficient plans ready to start the program. There are contractors with the "know how" and equipment and the manufacturers of construction equipment are producing new machinery at top speed.

Highway Departments Are Understaffed

But we are *unprepared* in that only a portion of the highway departments are adequately staffed with experienced engineers—from the top to the bottom—to launch a program of the size that must be undertaken.

We are *unprepared* in the fact that highway engineers are not paid in proportion to the importance of their jobs; and that other industries are paying salaries that attract engineers from the highway departments. This makes it almost impossible for the young engineers to look forward to a career in highway engineering. This fact alone is enough to produce a bottleneck that will interfere with the satisfactory prosecution of our work.

It is, of course, quite obvious that a mere increase in salaries will not change the ability of the men immediately—but if salaries are increased it puts men in more competitive positions to hold their jobs and they will be obliged to become more expert in the performance of their duties. At the same time, the higher salaries will attract new engineers to the highway departments and through more extensive study and application to the work the highway engineering profession will continue to have the highest calibre engineers.

Satisfactory salaries and continuity of service is the foundation upon which well trained and experienced engineers are developed. An engineer receiving an insufficient salary or worrying about where he will get his next job is working under conditions not conducive to efficient and economic engineering direction.

Chart Promotion Path

The engineering positions from the chiefs down to the lowest engineer on the job have requirements that can be described and classified. These should be set forth and then these positions should be filled by men that meet the requirements, both in training and experience. One of the great deficiencies in our highway engineering organizations today is the lack of enough men with basic engineering training. This is because many men working in engineering positions in highway departments were first employed to fill minor inspection jobs; they did their work well and after a few years of faithful work were shifted to *engineering* positions as a reward. This practice, in the long run, though there are many exceptions, is not conducive to building the best engineering organization nor is it fair to the individual who after a period of years in this advanced position without basic engineering training finds himself in a position where advancement is impossible. Either those men should be kept on inspection work and taught to become proficient in that line and pay them salaries commensurate with the importance of the inspection positions or, opportunity should be provided so the men could obtain a basic training in engineering.

More Short Courses Needed

With the big job ahead, every effort should be made to attract new personnel to the highway departments. States should make available short courses in highway engineering at state colleges or other educational institutions for the purpose of teaching the principles of highway engineering to returning military personnel and to civilians who have been engaged in war work which has now been discontinued.

Modern warfare, with its motorized ground units and airforce, made necessary the training of large numbers of engineers to build highways, bridges, and airports. This branch of the armed forces played a big part in the winning of the war, and in numbers, was a much larger percentage of the total than that of any previous conflict. Hence, there are many thousands of men who have had engineering experience under war conditions.

Some of these men had engineering experience and education before enlistment. Probably many more of them did not, and their engineering background consists entirely of knowledge gained in the war. A three-months' course in highway engineering would serve as a refresher for those with prewar education and experience, and as basic training for beginners.

To put this plan into action, a state should give the details full publicity. This would include information on the size of the proposed highway construction program, the nature of the work and the future prospects for the engineer. The future for the highway engineer was never brighter than it is at the present time. The highway modernization program will last for many years. To the prospective engineer, it means working in his own

locality, and opportunity for outdoor or indoor work or a combination of both and a choice of making the vocation a life's work, or shifting into construction work. The contracting industry also needs engineers.

Training Period Suggested

A three months' course in highway engineering should be offered to the applicant with remuneration for the period of study. This course should include enough subjects to give the prospective engineer an idea of the scope of the work and an outline of the important phases of modern highway practice.

Highway engineering must be made attractive enough to draw the best engineering talent into this field of activity; otherwise there will be insufficient skilled personnel to carry on the needed program. Military training in engineering during the war consisted of short courses of instruction. As a result, highly trained engineering units were developed and new methods of practice were discovered. Short courses would be just as successful if carried out by highway organizations now.

The state highway departments should list the positions which are open with the number of men needed to carry on the contemplated program. These would include chainmen, rodmen, instrument men, party chiefs, inspectors, draftsmen, designers, office engineers, locating engineers, construction engineers, maintenance engineers, resident engineers, bridge engineers and division or district engineers. Short courses should be arranged to train men in each of these groups so that there will be enough skilled personnel to provide adequate engineering supervision for the needed program.

Highway Engineers' Salaries

While we have most excellent men in the highway profession at the present time the new program demands that the number of efficient engineers must be increased. In many instances the salaries of engineers were reduced during the depression but in fewer instances have these salaries been reinstated. Local government units have ofttimes been too short-sighted in the standardization of their salaries for engineers and have watched only the salaried payroll instead of watching the production line. Engineers will be in charge of the expenditure of millions of dollars, and we all know that many times during a program an engineer is in the daily position of saving thousands of dollars for the department or losing or wasting many times the salaries of all the engineers put together. A quick summary of the salaries of state highway engineers will partially tell the story.

In 1929 highway engineers' salaries, in 44 states, averaged $7,106 per year. At the present time, the average of the highway engineers' salaries in 39 states is $7,400—an increase of five per cent over 1929. Only in five states the maximum salary of the highway engineer is above $10,000—in six states it is between $8,000 and $9,000—in 12 states it is between $7,000 and $8,000—in eight states it is between $6,000 and $7,000—in five states it is between $5,000 and $6,000 and in four states it is below $5,000. The bureau heads of the states average $5,000—division and district engineers average $4,650. These figures can only mean that the men in lesser positions get correspondingly less salary. Many highway departments claim they cannot get engineers and that is the reason they cannot accomplish their engineering work as they would like to.

The amount of the salary of highway engineers should not necessarily be compared with personnel of other routine positions in a state unless those other positions have the same responsibility of equal expenditures of state's money or unless the position controls and is responsible for activities that can have an equal economic appraisal. Modern highway engineering is a relatively new profession and many ambitious engineers have been attracted to it because of their desire to be active in its development and progress, regardless of current or unsatisfactory salaries—but with a hope of future reward.

Now, however, with the stress being paid to wages and salaries and the inflationary tendencies becoming realities outside the highway profession, the time has come when the engineers in the highway profession must be compensated in proportion to the value of the economic service which they provide—otherwise the already depleted highway forces will suffer casualties and the engineer will seek other fields, and the highway program will be carried on by engineers of lesser training and experience—thus causing the states to spend many times the amount of money that would have been necessary to develop and extend a most efficient and highly trained highway organization.

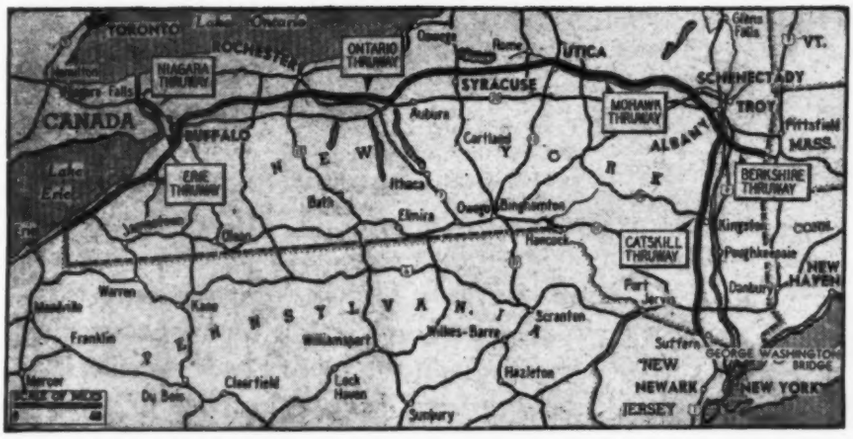
A speedy solution would be to pay adequate salaries. Trained engineers spend at least four years in college, sometimes additional time on graduate courses—then the years of experience during which they are reading and studying to keep abreast of the latest developments in engineering. Unless they are paid satisfactorily the highway engineering field will lose its engineers who will go to other engineering fields where the pay is better or they will even abandon engineering completely and go elsewhere. Even operating machines at the present time pays better money than some of the lower engineering positions. A professor of one of our great engineering colleges told me that his best graduate engineers went into railroading because it paid better salaries. If the engineers are worth that much to the railroads they surely are worth that much to the highway departments which are busier in a much larger construction program.

The American Society of Civil Engineers' study on this subject reports that all chief engineers should get a minimum of $9,600; principal assistants up to $9,360; division engineers up to $7,920 and the lesser jobs in proportion. Unless these salaries are held in the highway profession the engineers will migrate to other fields. It is economy to pay salaries that will attract the best engineers to the highway profession.

One study recently showed that in 1929, in 44 states, only 18% of the engineers received salaries of $3,000 or more a year—6% received $4,000 or more—2.6% $5,000 or more, and only 0.15% at least $10,000. To accomplish efficiently and economically the completion of the largest highway program yet to be carried on we must have the best engineers and in order to get them we must pay them satisfactory salaries. This reference alludes to state highway departments but the conditions are just as bad in the cities and much worse in the counties where the nationwide average salary level is from $2,000 to $3,000 per year. This analysis is made on what might be termed normal conditions, but this argument is all the more important because of the increasing higher cost of living, the inflationary tendencies, and the great job ahead. Another reason for secur-

Mail Inserted Card for Equipment Data

Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our Postwar Parade beginning on page 116, for which a numbered reply card has been inserted to help you request data on items that interest you.



N. Y. Thruway Work to Begin in Spring

★ Construction of New York State's 486-mile, 200 million dollar thruways will begin in the spring, according to the department of public works. Initial projects are planned west of Buffalo, on the Ontario and Mohawk sections (see map) and in the Catskill area. Planned as the 20th century counterpart of the old Erie Canal, this thruway system will pass within 30 miles of 90% of the state's population

ing the best experienced and qualified engineers is because roads are going to cost more in the future than they did formerly. If they are not constructed efficiently the economic loss is greater.

Cost of Construction

There is one other point that I would like to make. I have received during the past few weeks many letters relative to the trend of highway contractors' bids. In some instances, and a few well justified, states have declined to award contracts. Other states even when the bids are only slightly increased, have decided to defer the awarding of contracts until the prices become "normal." **A case study of the cost analysis of highway construction definitely points to the fact that the highways of the future are going to be more expensive.**

Not only is this true due to the more elaborate design to take care of the traffic demands and to produce safer highways, but all indications point to the fact that the cost of the several unit items will undoubtedly be greater than pre-war. However, with the new demands of traffic coming to our highways and the need of increased efficiency in transportation and communications, the awarding of contracts takes on a new standard of necessity. If the contractors' bids are not greatly in excess of the summation of the increased item cost that go to make up that bid then the award should be made. The engineers' estimate should be based on current conditions and not on prices obtained in the past; especially during the depression or during the transition period when the depression was still influencing the contractor bids.

The Public Roads Administration has made an excellent study on price trends in highway construction. These studies have also been made by almost every state highway department in the country. They show that with the 1925-29 period taken as normal the composite mile-index is now only 10% above normal. It shows that it is now 35% higher than 1941. 1941 was the last year when the abnormal price influence of the depression was still effective. Many of us are still thinking in terms of the prices which existed during the years of the depression. Many comparisons now being made are based on these prices. It will take another depression for these prices to exist again and the state that waits for such prices will simply be deferring the provision of needed highway facilities. The delay will cause much greater economic loss to the people of the state—a loss which will amount to many times the difference between the depression prices and the present day costs.

Specific Price Data

For excavation the average price for the 1925-29 period was 35 cents per cu. yd. This decreased steadily to 21 cents during the years 1938-40. In 1941 it went up to 24 cents and in 1942—the first real war construction year—it jumped to 37 cents, and in 1943 went as high as 44 cents. It is now back to 35 cents—or exactly the same as 1927. By no possible turn of events can it at any time in the near future return to the price that existed during the depression.

In the case of concrete pavement the average bid price per sq. yd. for the 1925-29 period was $2.29. This can be considered more or less normal. A low was reached in the depression of $1.44 per sq. yd. As late as in 1941, with the depression prices still influencing costs, a price of $1.89 was obtained. The following year, 1942, the price jumped to $2.44 per sq. yd., and the high was reached in 1944 at $2.54. There is a slight reduction in 1945.

In structural concrete, another major item, the 1925-29 period showed $22.65 as a normal average. This dropped to $15.33 during the depression and averaged $19.00 for the years 1937 to 1941. In 1942 this jumped to $26.00 and the peak was reached in 1944 at $31.94. This shows a slight decrease in 1945.

While we realize that with the labor difficulties at the present time and the shortage of manpower, contractors will be playing on the safe side and increasing their bids. Engineers know when this condition obtains and can act accordingly. But the engineer in considering awards should base his judgment upon current normal costs and prices and not those that obtained during the depression as has been the case in many comparisons and considerations of awards during the past month.

Repeating, the present day composite mile index is only 10% greater than the 1925-29 period, and even when compared with 1941, the last prewar year and the last year when deflated prices were an influence of the depression, today's prices are only 30% greater.

As a check on this reasoning I would refer you to the State of Oregon, where a careful study was made on this subject since 1942. When they prepared their estimates for the postwar program they took into consideration the increased prices that would obtain after the war. That these computations were accurate is shown in the first postwar contracts. The engineer's estimates averaged 5.9% higher than the low bids received and were only 2.1% lower than the second bids received. All contracts were awarded.

In taking into consideration the cost of postwar highway work they recognize the fact that wages had increased about 35% between 1940 and 1942. While wartime labor increased 65% it is felt that after the war wages will remain 20% higher. Labor at present is uncertain, in amount, quality and cost. Its present attitude is injecting a variable in the equation, making it almost impossible to solve. An analysis of the

(*Continued on page* 94)

JOB and EQUIPMENT IDEAS

Send in your contributions to this idea exchange and help road building progress. ROADS AND STREETS will pay a minimum of $10.00 each for any publishable field or office methods or shop kinks. Why not pass this along to your staff and encourage them to send in brief "how we did it" descriptions, rough sketches or snapshots.

Two Examples of Leveling Control Devices on Hot-Mix Resurface

RESURFACING with hot-mix using ordinary spreaders has sometimes posed a problem. That is how to vary thickness of leveling or wedge course material in order to correct waves, bumps, changes in crown, etc. as the machine moves along.

Two Ohio contractors on 1925 projects each devised leveling templates which rode the old pavement at the centerline. These bars were of sufficient length to perform a "straight-edging" function, supplementing the evening-up effect inherent in the spreader.

One case is that built by Horvitz Co. of Cleveland, (see Fig. 1). This bar consisted of a 10-ft. piece of angle iron fastened to an arm on the spreader frame. Slots in the

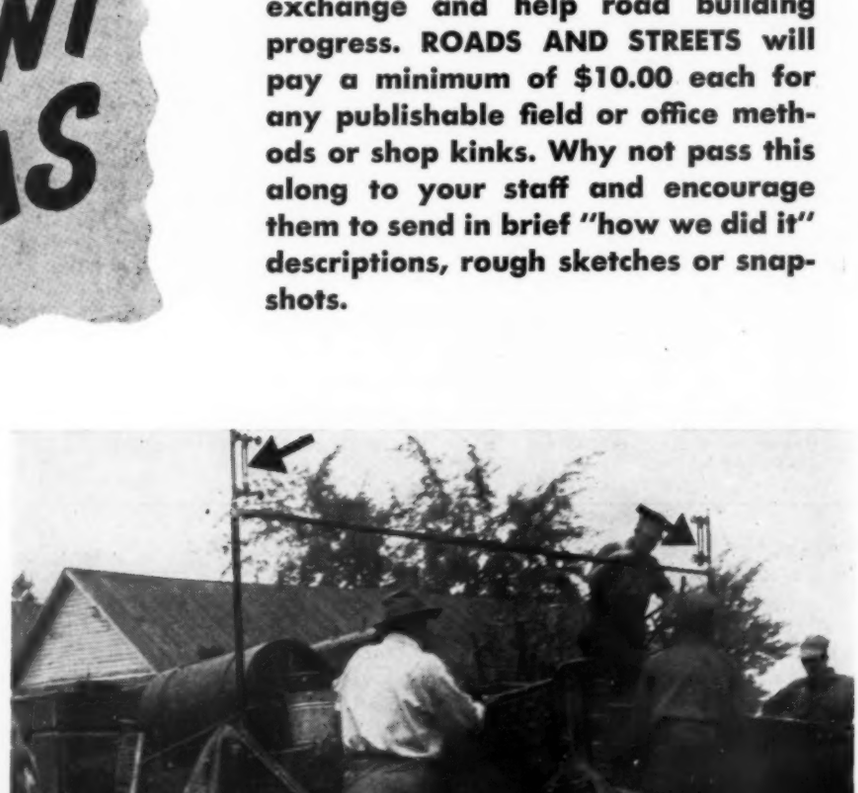
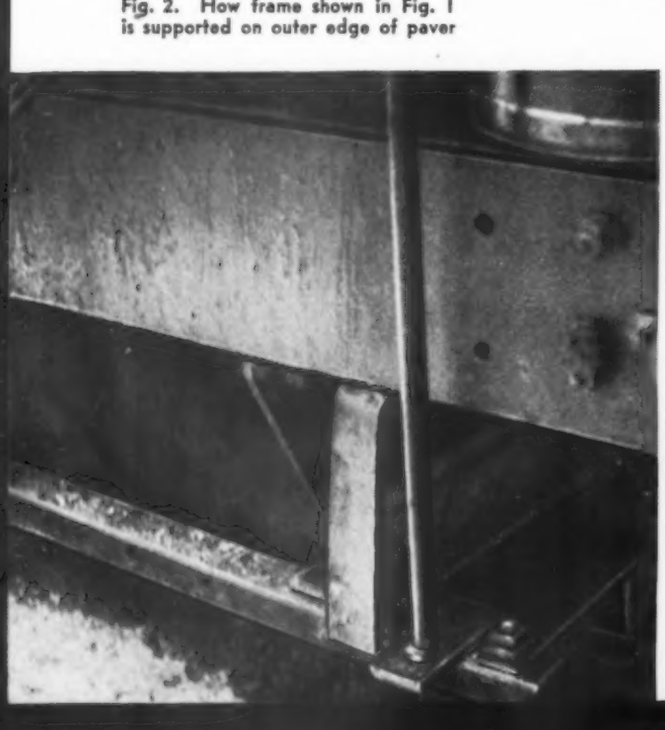


Fig. 1. U. S. Construction Co., level-indicator frame. Note arrows pointing to water gauges

Fig. 2. How frame shown in Fig. 1 is supported on outer edge of paver

★ Fig. 3. Water-leveling gauges over the spreader box



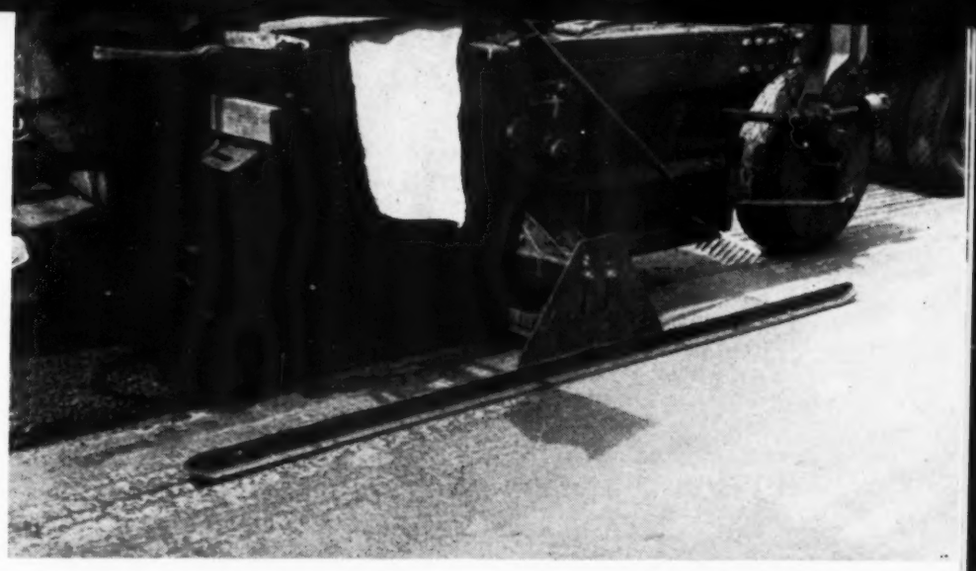


Fig. 4. Horvitz Company's leveling template

plate shown permit the bar to be raised or lowered and bolts tightened to any adjusted height desired.

Another example is a level-checking attachment used by U. S. Construction Co. of Upper Sandusky, Ohio, (see Figs. 1, 2 and 3). The device consists of a tubular frame over the spreader, on which are mounted a pair of connected glass water-level gauges.

The frame support on the outer side rests on a plate on the spreader frame, (Fig. 2), while the support on the inner or centerline side is carried on an I-beam straight-edge which rides the existing pavement. This pair of gauges, thus, serve as a visual check on difference in height between the outer edge of the course being placed and the centerline elevation of the old pavement.

A second pair of water gauges is mounted on the machine just over the spreader box, Fig. 3, to check the levelness of the two sides of the machine. Between these two gauge systems it is easy to control the crown as well as the depth of layer under construction.

Roller Operator Cuts Ditches for Surface Drainage

Toward the end of each day on airport grading the contractor begins to think about the chances of a rain during the night. If he's smart, he's seen that his men keep the fills well crowned and free from surface pockets that will hold water, create infiltration and make messy going next day if it does rain.

Simply by tilting his front roller as far as possible, the roller operator shown in the photo is busy cutting about 100 ft. of rough V-shaped ditch for this purpose. Photo snapped on Harrison Construction Company's 9,-200,000 cu. yd. airport grading job at Charleston, W. Va.

Mechanical Spreader for Curing Compound

One of several devices seen recently in use for spraying membrane curing materials is shown in the accompanying snapshot. It was taken on the U. S. 11 Alabama concrete paving project, the contractor being E. J. & W. L. Cobb, Inc. This gasoline-powered rig travels the forms and a longitudinal spray bar travels across from one side of the slab to the other, doing its stuff with the aid of a windbreaker hood. Let's see more attempts to control the uniformity of curing application.

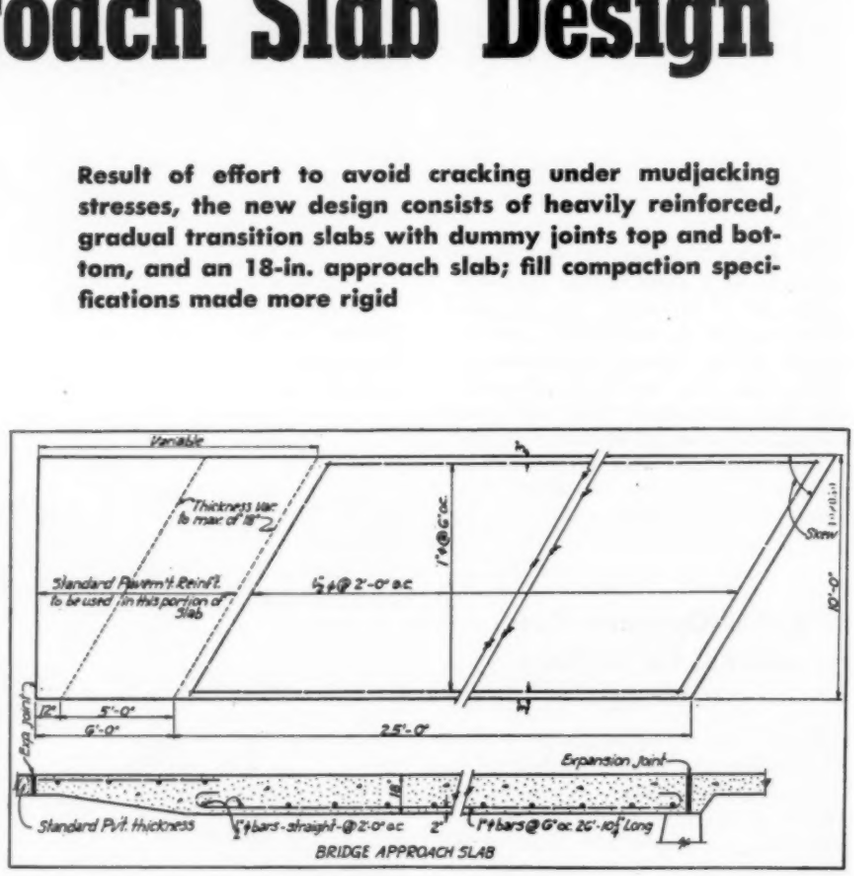
New Jersey Adopts Improved Approach Slab Design

Result of effort to avoid cracking under mudjacking stresses, the new design consists of heavily reinforced, gradual transition slabs with dummy joints top and bottom, and an 18-in. approach slab; fill compaction specifications made more rigid

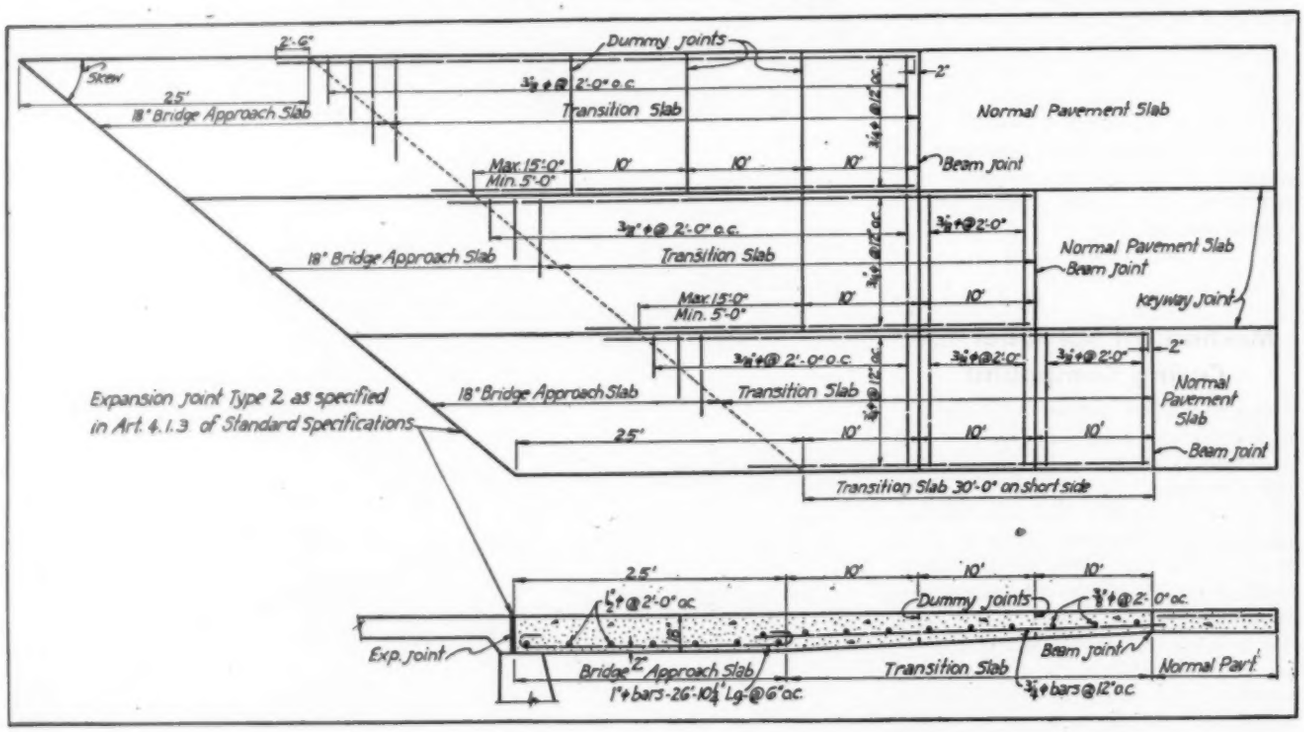
By F. D. Woodruff
Assistant Superintendent of Maintenance
New Jersey State Highway Department,
Trenton

THE concrete pavement immediately behind bridge abutments is a common source of trouble in many states, and New Jersey has had its share. The New Jersey state highway department has been a leader in perfecting the mudjacking technique for raising such pavement as fills settle.

The state's design standard for approach slabs heretofore has involved an abrupt transition from 18 in. thickness to the standard pavement thickness, this change of 9 inches or so being effected in a minimum distance of 5 ft. Some time ago it began to be apparent that this abrupt change in longitudinal section (see Fig. 1) contributed materially to ex-



★ Fig. 1. Previous design included an abrupt transition in pavement thickness



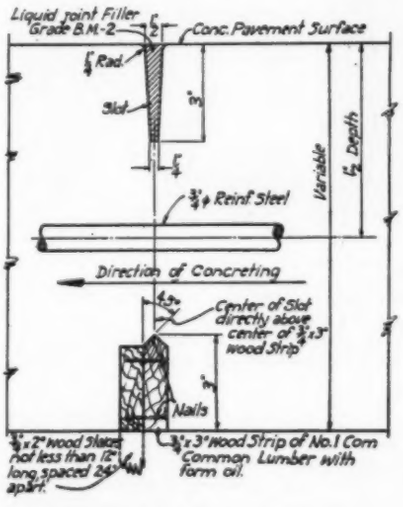
★ Fig. 2. Details of new design of approach and transition slab

cess cracking when settlement took place, and during mudjacking. One of the state maintenance foremen, Charles H. Weller, gave his attention to the problem and submitted a new proposed design based on his long experience in mudjacking approaches.

The elements of the design finally adopted are shown in Fig. 2. This design is the result of review by a committee consisting of the author as chairman and L. C. Peterson, H. D. Robbins and William Van Breeman of the highway department staff. This design eliminates the abrupt depth transition and steeply inclined bottom surface, substituting a gradual change effected in 30 ft. on the shortest side of each lane-width slab.

It is to be noted that one objective of the new design is to provide flexibility by means of dummy joints spaced at 10-ft. intervals in the transition slab. The reinforcement in the main 18-in. bridge approach slab is to be the same as that previously used for the first 25 ft. adjacent to the bridge abutment. (1-in. round hooked bars on 6-in. ctrs.) From this point, however, and for the entire length of the transition slab, ¾-in. diameter steel is placed midway between the top and bottom surfaces, tending, in case of settlement, to hold together the transition slab as cracking is encouraged at the dummy joints.

Spacing of reinforcing steel, location of dummy joints, slab dimensions and other construction details, are shown in Fig. 2.



★ Fig. 3. Detail of dummy joint in new design

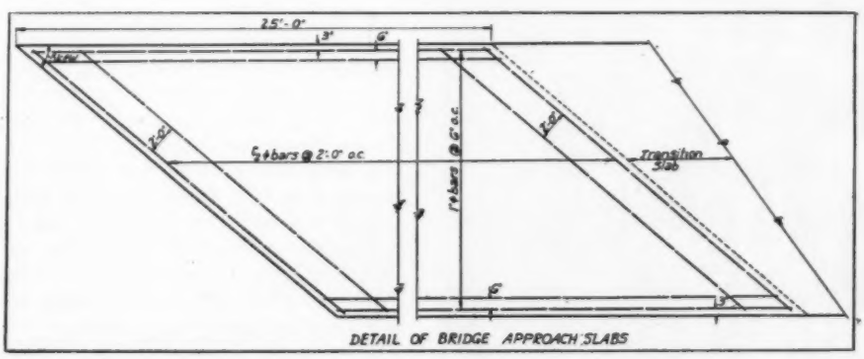
Better Fill Compaction

The Committee, in its contemplation of the design of an improved approach slab, logically gave thought to the factors causing settlement in such slabs and it followed, naturally, that the placement of approach fills should receive careful attention. After due consideration, it was felt that far better compaction of such fills could be obtained by a more careful control over the space to be occupied by the equipment placing and consolidating the material placed adjacent to bridges. The following recommendations concerning the placing and treatment of such fills were presented and subsequently embodied in specifications:

1. Without exception, all fill placed adjacent to bridge abutments shall be placed and consolidated in layers in accordance with Article 2:4:3 on Page 45 of New Jersey Standard Specifications (1941).

2. In order to accomplish the placement and consolidation of the fill as specified, all roadway embankments that are to be constructed prior to the placement of said fill shall terminate at a point not less than 10 feet from the abutment footing and shall be graded back from that point on a slope not steeper than 5:1 (20% grade) or flatter if necessary in order to permit the proper and efficient operation of trucks, distributing and consolidating equipment on the surface of the slope during the placement of said fill.

3. Where the slope of the natural ground adjacent to bridge abutments is steeper than would permit the proper and efficient operation of trucks, distributing and consolidating equipment on its surface during the placement of said fill, the natural ground shall be graded on a slope as specified hereinabove for roadway embankment.



★ Fig. 4. Further details of the approach slab shown in Fig. 2.

Rudy Hoff Is Dead

Rudy J. Hoff, 51, Vice President and General Superintendent of Johnson, Drake & Piper, Inc., general contractors, New York City, died on Dec. 19 in the Long Island College Hospital, Brooklyn, N. Y. Mr. Hoff was from Red Wing, Minn., where he worked with his father, a pioneer Midwestern contractor, prior to 1920, when he became associated with his present firm. During his 25 years with this company, he supervised many important highway projects in Minnesota, Iowa, Florida, Pennsylvania and New York. During World War II he was in charge of the air base runway construction on the Aleutian Islands, Alaska, and also the planning and procurement of construction machinery for his company's U. S. Army contracts in Africa and the Middle East. He was well known for his mechanical ingenuity and organizing ability. His important work includes the construction of Long Island's Sunrise Highway, Jones Beach, Ocean Boulevard, and other parkway projects.

Pensy. Safety Drive Against Oldsters

Accidents on the roads involving older drivers, especially those in the 65 to 89 year age bracket are in the spotlight in Pennsylvania. The state's bureau of highway safety has found that their accident rate of "over 50" drivers is higher than the average. Major accident causes in this state are: speeding, wrong side of road, ignoring hills, curves and intersections, driving while intoxicated, ignoring pedestrians.

•

Legal limits of weights per axle in various states now range from "no limit" in two states and 22,400 lb. in three states, down to 16,000 lb. in two states. Vehicle lengths now permitted range from 65 ft. down to 35 ft.

•

Two Chinese engineers sent by their government are studying highway design and construction methods with the Connecticut state highway department.

Special Trenching Rig

Cuts Beveled Ditch Section

A. J. Baltes, Inc., put down 72,000 ft. of drain tile in jig time on Ohio project

By C. R. Hanes
Field Engineer, Bureau of Construction,
Ohio Department of Highways, Columbus

IF you had to dig 15 miles of drain trench along a pavement edge, you'd probably use an ordinary mechanical ditcher. But if you were confronted with a special cross section, involving a lot of (try-and-find it) hand labor, you'd probably set your head to working on some labor-saving idea.

Which is exactly what was done by the crew of A. J. Baltes, Inc., of Norwalk, Ohio, when this outfit was awarded a 6.9-mile special trenching project on Route in Columbiana County, Ohio, this past year. But first to describe the project briefly. The concrete pavement on this heavily traveled industrial and coal hauling route had suffered quite a lot of breakage and pumping. A 2-in. asphaltic concrete resurface was applied in 1942.

Adverse subgrade soil and excess moisture were determined as the principal cause for the original breakage and pumping, and the comparatively light resurfacing did not entirely correct the condition.

A drainage system was then designed, and A. J. Baltes was the successful bidder. The proposed underdrainage consisted of 72,000 ft. of pipe from 4 to 8 in. in size. This pipe was centered 3 ft. from edge of pavement and generally at a depth of 5 ft. below the pavement edge. From a point 2 in. below the edge of the

★ Note in the two views how the cutting bucket (shown above in contact with ground) is alternated with toothed scarifiers and planers

★ The standard trenching boom and buckets are shown at the right, and at left is the auxiliary fixed-position boom designed to cut the sloping surface between trench and pavement edge

concrete the trench was to be sloped on a 30° slope with the horizontal to meet the regular pipe trench. The trenched-out section, immediately over and around the pipe as well as in the slopes section, was to be backfilled with porous aggregate, topped with 5 in. of graded aggregate capable of being compacted.

It was because of the large amount of pipe involved, that Mr. Baltes developed the special attachment for cutting the sloped section as well as the regular trench. This attachment consisted of mounting an auxiliary boom with cutting blades set to the proper angle alongside the regular boom on a Buckeye 120 trencher. Since the auxiliary boom cut in constant relation to the pavement grade, it was set in a fixed position. The regular cutting boom was adjustable to cut to the variable depths specified.

All of the excavated material was to be replaced with porous backfill and the material hence was loaded directly from the trencher into trucks.

The trencher as adapted to this particular job proved very satisfactory. Occasional delay was experienced when large boulders were encountered, as is true in any trenching operation. This project is the only one on which the equipment has been used. Another project having a similarly designed trench was built earlier using two separate trenchers, neither equipped with the sloping cutting blades.

Porous backfill aggregate was struck off with a power grader with auxiliary blade set to strike off to such a depth that it would be to the proper height when compacted.

The efficiency and success with which the equipment operated is indicated by the fact that the 72,000 lin. ft. of pipe was installed in approximately a 3-month period with a minimum of labor.

★ Another view of the blade attachment used in backfilling. An end plate welded on the outer end served to keep gravel from spilling outside the trench area

★ Backfill material was bladed into the trench from windrow on the pavement. A special dropped blade section struck off the ditch at proper height for rolling

$20,000,000 Airport for Pittsburgh

Under plans drawn up by the Allegheny County Department of Aviation, the Pittsburgh district will have what is termed to be the world's second largest airport. Costing eventually more than 20 million dollars and to cover 1,500 acres, it will comprise an expansion of Moon Township airport, this very heavily graded army-built field having been built with three runways early in the war at $5,300,000 cost. According to county commission chairman John J. Kane, new construction will be completed in 1947 to provide facilities for handling 30 planes an hour.

★ (Left): The finished trench—neat job. (Right): Before the trencher came along an initial blade cut was made to expose the pavement edge and start the beveled portion of the trench

An Outline of Prospective
Highway Research in Kentucky

Mr. Gregg, author of this noteworthy outline, was recently placed in direct charge of the research laboratory and research work of the Kentucky department of highways, under Professor D. V. Terrell, dean of engineering, University of Kentucky, and has been retained as director of research. To assist Mr. Gregg in planning the program, a Research Board was created. Holding the first of monthly meetings in December, this board consists of the following:

J. S. Watkins, comm'r. of highway; T. H. Cutler, state highway engineer (chairman of the research board); H. St. G. T. Carmichael, Jr., first asst. chief highway engineer (vice-chairman); G. R. Logue, director of construction; George Hailey, director of rural highways; H. D. Metcalf, director of maintenance and equipment; John Bitterman, materials engineer; D. H. Bray, director of design; H. R. Creal, bridge engineer; T. R. Lannon, director of planning; Prof. D. V. Terrell, dean of engineering; Prof. R. E. Shaver, professor of civil engineering on university staff.

By L. E. Gregg
Associate Research Engineer,
Kentucky Department of Highways,
Frankfort

THE following outline and comments are intended to serve as a general guide for future endeavors of the Highway Materials Research Laboratory, and as a basis for discussion among members of the Research Board. For the most part these will provide a structure within which the details of individual projects may be classified and from which the subject matter for separate studies may be drawn. By preparing such a plan, but recognizing the need for deviation when unforeseen situations arise, it is hoped that the possibilities for maintaining a comprehensive but well integrated research program may be enhanced.

Specific Projects

Most of the proposed work set forth with any amount of definiteness is of the protracted variety, but even these long-time studies could and should be subdivided into parts convenient for progress reports at various intervals.

Also separate phases of particular projects such as one dealing with aggregates would necessitate investigation from several standpoints, for example:

Chemical and mineralogical properties from the standpoint of geology and chemistry;

Soundness, hardness, durability and thermal properties relative to uses in concrete and bituminous mixes:

Other applications such as subgrade treatments or insulation courses.

Further than that, field performance surveys and experimental roads constitute a means for final evaluation of results obtained in the laboratory.

For the purpose of this outline the subject matter has been divided into six major categories designated as concrete and aggregates, bituminous and bituminous mixes, soils, chemical, physical, and field observations. To these, other material such as traffic—drivers, reactions to signs and traffic hazards—and similar highway problems could be added if time and conditions warrant. Before any project work is undertaken, a working plan stating the objectives and intended procedures will be prepared for discussion and approval by the Research Board.

Concrete and Aggregates

A total of 21 research projects dealing with concrete and constituent materials have been completed or are now in progress. (A summary report of four projects is being submitted at this meeting of the Board and there will be similar reports in the future.) These have brought forth numerous valuable results and have provided clues for profitable work in the future. Furthermore, some of these are correlated with field construction projects, thereby providing a source of information for several years to come.

Although a considerable amount of work has been devoted to air-entraining agents and cement blends by various research organizations during the past six or eight years, the results of tests in this laboratory and elsewhere indicate that much investigation remains to be done. This is particularly true when the problem is considered from the standpoint of aggregates. As shown by some of our results, the benefits of air-entraining agents are not a constant factor so long as the aggregates are variable. This observation leads to speculation regarding the properties of some aggregates which apparently result in poor field performance, yet cannot be detected by present test procedures.

Most of the states are concerned with contrasting situations, where pavements with and without provisions for expansion and contraction are found to crack, warp, and blow up while others of both types are free from this condition. This is true, although the cross-sections, reinforcing, and traffic and weather conditions in both cases are similar. If this is a characteristic dependent on aggregates, the problem is not only to find which ones cause this result, but also why, and how materials of that nature may be recognized.

A study of aggregates and sources of aggregates using commonly accepted tests, supplemented by some which may be developed, could possibly reveal the reasons for some failures and provide a means for recognizing defective properties. Measurements for expansion and contraction of concrete in the laboratory and in the field, evaluation of the growth of pavements over long periods of time, studies of the specific heat of aggregates (as a factor in expansion aside from the coefficient of expansion of the concrete itself), and similar tests are proposed for this study. In conjunction with these, a geological in-

dex of sources of these materials should be valuable for correlating information obtained in other ways.

Bituminous Materials and Mixes

With the recent development of a coring bit for removing samples from bituminous pavements, the laboratory is in a favorable position for investigating more thoroughly bituminous mixes and related flexible pavements. To date fourteen projects of this nature have been completed or are in progress, but throughout these studies one of the most indefinite features has been the density of the mixes prepared in the laboratory as compared with the densities of similar materials prepared in the field. It now appears possible that density measurements on cores taken from the highways will reveal inconsistencies between laboratory and field compaction, and provide a basis for revision of the former, if such is necessary.

Further than this, the samples taken from the pavements can serve not only as a means for density measurements but also as specimens for stability analysis—an innovation of utmost importance. Immediately following the construction of experimental roads, cores could be extracted and brought to the laboratory for stability tests. These could be followed by sampling at certain intervals over several years' time to evaluate changes in the pavement resulting from weather, traffic, and age. Likewise the experimental roads constructed in the past could be analyzed in the same way and the results correlated with those obtained from condition surveys that will be mentioned later.

To supplement stability measurements by the Marshall procedure, now used exclusively for obtaining design data, other techniques such as the stabilometer and shear tests, as well as axial and tri-axial compression are proposed. The latter, although cumbersome and time-consuming, offers the advantage of fundamental determinations of shearing resistance which should add significance to results from arbitrary test procedures, and it may provide new bases for theoretical solutions in the design of flexible pavements.

Other than these, research dealing with the bituminous materials themselves (their consistency and structure) should be of some immediate value. Crack and joint filler as well as provisions for raising slabs and filling the void space beneath faulted joints are additional factors of interest.

Soils Problems

Foremost among the soil problems in highway engineering at the present time is that of pumping of rigid pavements. With the advent of extremely heavy loads during wartime these pavements have sometimes been severely damaged because of pumping at the cracks, joints, and edges of the slabs in situations where moisture contents and soil properties are favorable to this action. Much discussion and some research have been devoted to this problem, but at the recent meeting of the Highway Research Board Committee on Pumping it was the consensus that very little specific information has been compiled which would assist the engineers of design and maintenance in coping with this problem.

By using the data now being accumulated through performance surveys conducted by the Department of Design, it will be possible to locate the sections where pumping has occurred to a serious degree. Samples of soil obtained from these locations, as well as other samples taken from beneath pavements that are performing satisfactorily, should provide more accurate determination of the soils that will pump versus those that will not. Analysis of these materials will require (in addition to the routine physical tests for limits of consistency, grain size distribution, compaction, and shrinkage and expansion) California bearing, tri-axial shear, and perhaps consolidation tests to determine their bearing power and deformation characteristics.

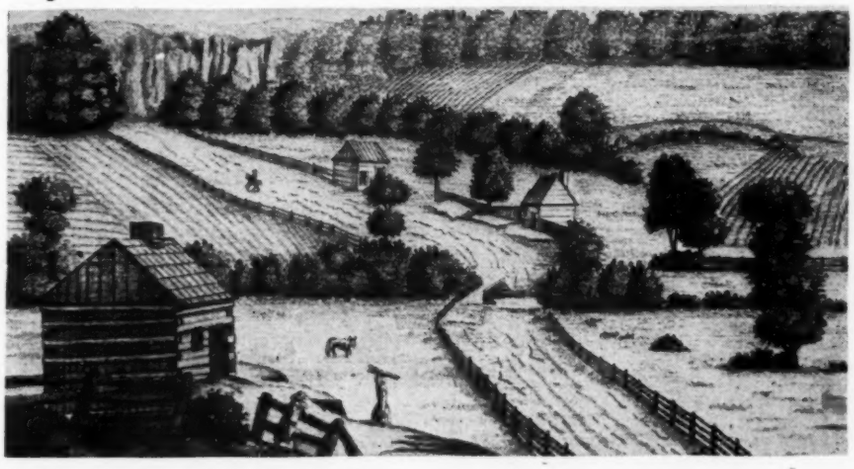
In addition to these, permeability measurements obtained in a practicable yet reasonably accurate manner are of considerable consequence. As was the case with aggregates, classification of soils in accordance with origin and on a geological basis is proposed, with the ultimate objective being an engineering Soil Map of Kentucky. Other soil studies relative to stabilization, subgrade treatments, embankments, and even perhaps to bridge foundations, cannot be excluded.

Chemical Considerations

In any organization dealing with highway materials it is essential that provision be made for chemical analysis incidental to the tests for other properties. Although much of this is of a routine nature, there are many things which could be exploratory and complete within themselves. Among these are studies of paints, bituminous materials — possibly through microscopic and photographic methods—and even some applying to soils and aggregates.

In Days of Old

Roads and Roadbuilding in Years Gone by



Bettman Archive

★ This is the type of a road from which the word "turnpike" originated. The view shown in the engraving of 1788 is from Bushongo Tavern, 5 miles from York Town. As the story goes, when it was desired to shut off travel on this road long poles in which spikes had been imbedded were thrown across it. When traffic was open, the spikes were turned away on the road side. From "turned spikes" came "turnpike"

With regard to soils there have been reasons to believe that the physical tests commonly used are not sufficient to reveal all the characteristics of the materials and their reactions to loads, moisture, and other influences. Here chemical analysis may show that chemical properties are often more important than features such as voids, grain size, and structure.

Also in this category is speculation concerning waterproofing materials for soils and aggregate other than those which have been proposed during the past few years. Some of these ideas have been taken directly from industrial processes such as those applicable to the flotation of metals in extracting minerals from the low grade ores. This is dependent upon chemical principles relative to the molecular structure of the materials, and it requires analysis of a specific nature by one thoroughly trained in chemistry or chemical engineering.

Physical Approach

Physical testing, as used here, denotes investigation with the circular track which is now in the process of completion at the Research Laboratory. With that apparatus, ideas and combinations of ideas developed through research in other sections could be studied under controlled temperature, moisture and loading conditions. It will be necessary that specific projects for this purpose be arranged as time and other research endeavors permit.

Field Observation

The ultimate objective of all research dealing with highway materials is the application of ensuing data to the highways themselves. Thus, studies of highway performance and experimental roads are logical means for evaluating laboratory results and the effect of their incorporation in practice. Aside from the large number of variables which cannot be isolated nor distinctly correlated, the highway system serves as a proving ground and as an indicator of factors which need investigation.

To obtain a maximum of value from experimental sections, it is necessary that there be periodic sampling of the surface and the subgrade supplemented by condition surveys. In that way, long-time laboratory studies (for example, those where samples are exposed on the roof) can be compared with long-time field exposures, and conclusions drawn. As an immediate objective, existing experimental roads, the locations of which can be obtained from information below, will be utilized for purposes set forth above.

Among other observations that may be made, are moisture contents on subgrade soil samples analyzed in the light of weather records from various parts of the state, and methods for raising settled slabs and filling voids at faulted joints as mentioned in previous sections of the outline.

THANKS, JOHN LEWIS

By Halbert P. Gillette

CONTRARY to the old saying that "there is nothing new under the sun," a brand new thing has been developing in recent years. The leaders of two of America's largest labor unions recently have become outspoken advocates of increased productivity by workers as a means of securing higher wages. I refer to Green of the American Federation of Labor and Lewis of the United Mine Workers of America. Moreover, both are in favor of free enterprise and wage agreements made directly between employers and employees. They want no more government control of wages.

Opposed to them, in a measure, is Murray, head of the CIO, who, according to Lewis, is mistakenly leading his union toward government ownership of coal mines. Lewis dealt Murray "a solar-plexus sock" when he called attention to the fact that the average American miner produces six tons of coal to one ton produced by the average British miner; and, by doing so, gets three times as much cash in his weekly pay-envelope.

There is one important fact, however, which Lewis did not mention, namely, that for many years American coal miners opposed the introduction of coal mining machines. In 1900 only 25% of American coal was mined with machines, although such devices had been economically used for a generation. But by 1915 more than 55% was thus mined. At that time, according ot an authority, "In Great Britain less than 10% of the coal output was mined by machines." And, as I recall it, the average American miner produced three times as much coal as the average British miner at that time. Since the ratio now is six to one, it is evident that British labor unions have continued their opposition to coal mining machinery, whereas American miners have favored it.

About 1910 I was told by the president of a company that manufactures mining and quarrying machinery that his company had been unable to sell a single rock-channeling machine to a British quarry owner. The reason was the opposition of the quarrymen to such machines. So, while Lewis justly takes pride in the change of his union's policy that has occurred, still that change began primarily because not all American coal miners were unionized. Furthermore, it was inventors and mining engineers backed by executives and capitalists who were primarily responsible for the high output and high wages of American miners.

In desperation British miners and other members of labor unions have become socialists in the hope that somehow the British government will be able to raise their wages to the level that prevails in America. A futile hope; for the introduction of bureaucratic control of the mines will merely make bad matters worse. When will they learn that competitive free enterprise is the only route to high wages such as prevail in America? And when I say "free enterprise" I mean enterprise free not merely from governmental but from labor union dictatorship.

FWA Advances $13,248,000 for Plans

Advances in Federal Works Agency funds aggregating $13,248,246 for the preparation of plans and specifications for 1,826 proposed public works projects to cost an estimated $564,932,291 had been approved up to Dec. 31. A total of 4,175 applications, for an estimated expenditure of $1,686,097,204 had been received up to Dec. 31. The public works included the following:

Highways, roads and streets, (not included in the Federal-aid Highway System) 100, to cost an estimated $15,651,960.

Bridges, viaducts and grade separations, 27, to cost an estimated $19,358,982.

Airports, 11, to cost $4,125,248.

IT TAKES A SNOGO TO DO THIS JOB!

BREAKING OUT DRIFTED ROAD—NO BANKS BUILDING UP HERE

SIDE CASTING—A WIDER SAFER HILLSIDE ROAD

If SNOGO can't do it—no other snow plow can!

Snogo should be the mainstay of every highway snow removal fleet. Here is a tested machine—tested by years of operation in every type of snow condition known to highway men in the country. When you buy Snogo you are buying dependability!

Let us show you a Snogo at work this winter. You'll note that the wide range of travel speeds permits perfect handling for any type of snow.

Even feed, a full discharge results in a bigger load of snow thrown farther than you have ever seen snow thrown by any type of plow.

Snogo's simplicity—one fan, freedom of discharge complications, smooth transmission of power and tested hydraulic controls—means trouble-free service and lower cost operation.

Snogo is the best insurance that any highway department can have for full snow control. Snogo puts the snow off the road, eliminates those road-side banks that trap and clog once cleaned out roads, reduces repeat plowing and removes drifts that will block other types of plows.

If Snogo can't do it no other type plow can.

KLAUER MANUFACTURING CO.
DUBUQUE, IOWA

KING OUT A DRIFT—THAT SNOW STREAM

PUTTING THE BANKS INTO THE WOODS

SNOGO
A SNOGO For EVERY BUDGET

What Price

Maintenance Cost Data?

What should be the purpose of cost records? How are they valuable? Can they be fully standardized? What are their limitations? What expense is justified in their compilation? In attempting honest answers to these questions the author touches the very foundation stone of engineering

By E. L. Worthington
State Maintenance Engineer
The State Road Commission of W. Va.,
Charleston

THERE has always been a diversity of opinion among highway men as to how much cost accounting is necessary and justified in connection with highway maintenance work.

This diversity of opinion, I think, is due to a large extent to the natural difference in the personalities of the individuals in charge. Some officials are sticklers for detail and voluminous cost records, whereas others have an aversion for such details.

Regardless of such differences in personalities the extent to which the keeping of cost data can be logically justified depends entirely upon the useful and beneficial purpose that the data serve after they have been compiled. If facts are made available and then not used, the time and effort expanded are wasted; conversely, if pertinent data are needed and not available, then the lack of this information is a handicap to proper management.

Purposes of Costs

In the writer's opinion, the principal purposes of accumulating cost data pertaining to maintenance work may be summed up as follows:

1. To determine the cost of doing work, or operating equipment.
2. To furnish records with which to determine the advisability of continued use of certain types of material or equipment.
3. To afford basis of comparison in the cost of maintaining different types of pavements, surfaces, or equipment.
4. For future estimating purposes.
5. To facilitate the budgeting and allocating of funds, and to furnish authoritative figures upon which to base legislative appropriations.
6. As a basis of comparison between state force and contract work.
7. To stimulate competition between Counties and Districts.
8. To determine administrative and overhead costs.
9. To enhance the morale of state employees from the standpoint of conserving the taxpayer's money.
10. To furnish records for Annual Reports, required by law in many of the states.

The question of the *value* of cost data is involved, therefore let us analyze, in the order in which they are listed, the ten purposes of acquiring such data, in order to, if possible, determine the *value* together with the *expense justified in obtaining the costs.*

1. To determine the cost of doing work, or operating equipment:

It is certainly desirable, even if not absolutely necessary, to know what it costs to do various kinds of maintenance work, or to operate various types of equipment. However, I am inclined to believe that in too many instances the data actually gathered are *merely interesting rather than informative or useful.*

True Comparison Difficult

There are so many variables in connection with the cost of doing maintenance work that the record obtained does not always present a true picture of the cost involved, as compared with other similar jobs.

For example, two surface treatment jobs may be in progress in different counties at the same time using identical items of equipment and the same kinds of materials. Assuming that careful cost records are kept on both jobs, I venture to say that the cost per square yard on the two jobs will vary from 10 to 20% due to differences in personnel, supervision, weather conditions, proximity of quarries or railroad facilities, and procedure methods.

The operation of identical items of equipment also involves disturbing variables such as the human element in operators, different working conditions and to some extent different mechanical perfection of manufacture even in the same make of equipment.

However, such variable data can be used as a basis of comparison and may serve a useful purpose if, as a result of the figures obtained, an honest effort is made to reduce future unit or over-all costs.

2. To furnish records with which to determine the advisability of the continued use of certain types of materials or equipment:

If carefully compiled records were to show conclusively that certain types of materials or equipment were superior, then it would not be at all difficult to convince the average citizen that those materials or equipment should be given a definite preference. But, would it be practical, or even advisable, to establish and follow such a policy?

Competition as Well as Costs?

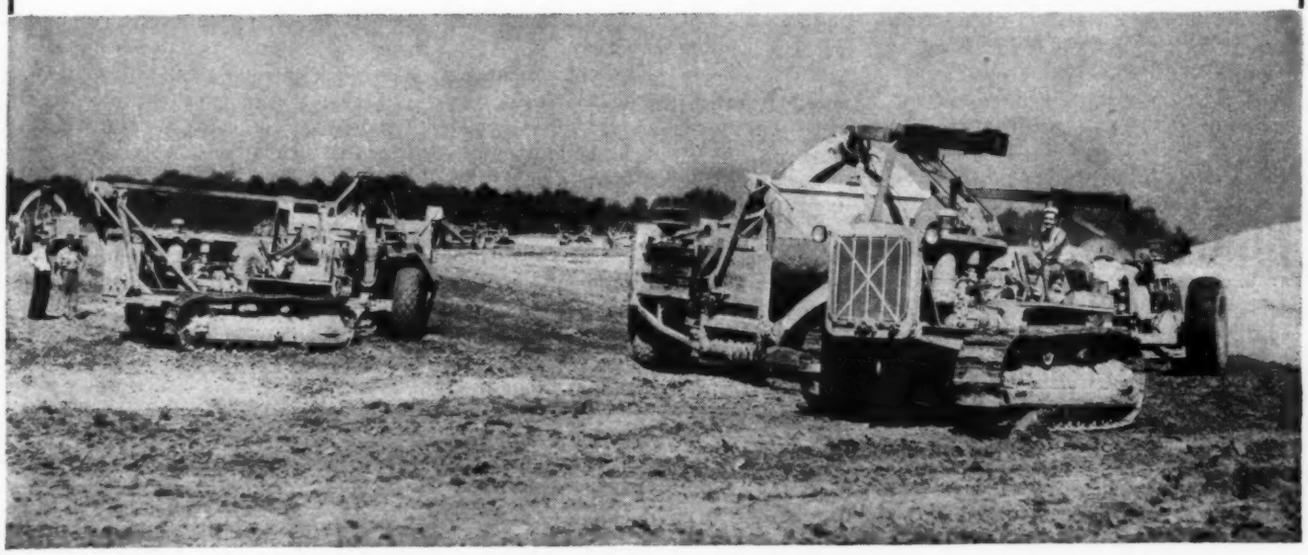
After you have kept careful cost records on the maintenance of a certain type of bituminous pavement, or on the use of certain materials, and have concluded that tar is better than asphalt, or vice versa, are you then going to eliminate competition by the exclusive use of the one kind of material? And even if you decided you could justify the lack of competition, do you suppose you could withstand the pressure which the unfavored producer would be sure to administer?

All governmental agencies are

Note: This article was given as a paper before the Southeastern Association of State Highway Officials, Atlanta, Dec. 2, 1945.

"GULF DIESELUBE H.D. keeps our engines clean, helps us get better performance and lower operating costs"—

*says the Contractor on this Airport project**



* Frank Mashuda Company, Mansfield, Ohio, recently completed the grading contract for the $3,000,000 Mansfield Airport project, which required the removal of approximately 2,000,000 yards of dirt. Gulf Dieselube H.D. helped this Contractor keep equipment on the job and operating efficiently.

"GULF DIESELUBE H.D. has done a great job for us," says Frank Mashuda, Contractor on the Mansfield, Ohio, Airport project. "This heavy-duty oil keeps our engines clean—provides the kind of lubrication for both our gasoline and Diesel equipment that means better performance and lower operating costs."

Use Gulf Dieselube H.D. in your equipment and see how it can help you cut down on repairs and overhauls. Take advantage of the extra value you are offered in these four points of superiority in Gulf Dieselube H.D.:

1. Detergent action helps keep motors cleaner.
2. Helps prevent ring sticking and minimizes cylinder wear.
3. Noncorrosive to alloy bearings.
4. Nonfoaming under all temperature conditions.

Gulf Dieselube H.D. is approved and recommended by leading manufacturers for both automotive-type Diesels and for gasoline engines operating under heavy-duty conditions.

For further information on this modern heavy-duty oil, write, wire, or phone your nearest Gulf office today. If you have not yet received your copy of the new Gulf Diesel Lubrication Book, send the coupon below.

GULF

Gulf Oil Corporation · Gulf Refining Company

DIVISION SALES OFFICES:

Boston · New York · Philadelphia · Pittsburgh · Atlanta
New Orleans · Houston · Louisville · Toledo

Gulf Oil Corporation, Gulf Refining Company R&S
3800 Gulf Building, Pittsburgh 30, Pa.

Please send me, without obligation, a copy of the new Gulf book, "The Lubrication of Automotive Diesel Engines."

Name.....

Company.....

Title.....

Address.....

directly supported by the taxpayers Taxpayers are composed of corporations as well as individuals, and the corporations which produce road building materials, for example, expect the right to sell those materials, providing they are at all suitable for the purpose for which they are designed, regardless of whether or not carefully kept cost records would indicate that a certain material results in a pavement surface which is easier and cheaper to maintain.

Furthermore, if carefully kept cost records would indicate that a 1½ ton "X" brand truck, say, is cheaper to operate than a 1½ ton "Y" brand (or vice versa), would you be justified in using "X" trucks exclusively? And even if you were justified, would you be able to do so? I doubt it—we can't in West Virginia, and personally I don't think we should, because we like healthy competition and we like to see all our dealers of comparable equipment or materials have an opportunity to do business with us if their products show reasonable efficiency and economy.

Cost Records Stimulate Efficiency

Furthermore, I don't think this obviates the necessity for keeping operating cost records, because such information given to manufacturers stimulates their desire to produce an item of equipment which will compete more closely as to operating costs as well as price. At the same time it gives the highway department an axe to hold over the head of the manufacturer of the higher operating cost equipment.

Such cost records also encourage the producers of certain road building materials to produce better products. All such records if properly used are a definite stimulant to progress.

3. As a basis of comparison in the cost of maintaining different types of pavement surfaces:

Again, as in the case of materials and equipment, cost records may show conclusively that a certain type of surface is cheaper to maintain. But the final decision as to what type of pavement should be used must be based upon an overall long-range picture, which would necessarily have to take into consideration such factors as initial cost, amount and type of traffic, availability of local materials, availability of labor, climatic conditions, topographic conditions, soil conditions, and last, but not least, the financial status of the governmental agency. All such factors must be given consideration regardless of what cost records might imply.

But again I would say there is justification for keeping sufficient cost records to afford at least a summary comparison of overall maintenance costs.

4. For future estimating purposes:

Cost records are particularly valuable in furnishing data for estimating purposes. The highway engineer is forever being called upon to make estimates of costs. I'll grant you that in many instances such estimates serve only as an alibi to keep from doing some job which does not have sufficient merit to justify itself, but at that, it serves a useful purpose. In other instances, estimates serve only as a basis of an argument, but are essential nevertheless.

Furthermore, there are innumerable other instances in which it is very necessary to make estimates which have an important bearing upon the proper functioning of a highway organization.

5. To facilitate the budgeting and allocating of funds, and to furnish authoritative figures upon which to base legislative appropriations:

At the beginning of each calendar or fiscal year it is necessary to set up some form of a budget to forecast the spending of the ensuing year's funds; and barring unforeseen contingencies it can be anticipated with a reasonable degree of safety, that the expenditures during the previous year will serve as a suitable guide for the new year's spending. Hence cost records will serve the purpose of providing an adequate indication of ensuing year needs.

In many instances it is also necessary to allocate funds for specific purposes such as routine maintenance, special maintenance, additions and betterments, and construction and reconstruction. To make such allocations on an equitable and need basis it is essential to have dependable previous cost records.

Funds for state highway maintenance are usually appropriated by state legislatures, and legislators have a way of demanding figures, regardless of whether or not those figures have a logical import to them. Past cost records must be available as a criterion.

6. As a basis of comparison between state force and contract work:

Frequently the question arises as to whether state force or contract work is the most economical, and the only way of determining the economic phase of the question is by keeping accurate cost records for comparison between state force and contract costs on similar work.

Personally, I don't think the economic phase should be the only basis upon which to arrive at a decision involving state force or contract work, because there are other important factors which should be given due consideration, but that is beside the question in this particular issue.

Healthy Competition Needed

7. To stimulate competition between counties and districts:

Earlier in this paper I mentioned the fact that because of uncontrollable variables the cost of identical types of work will vary in different counties or districts. Nevertheless, if carefully kept cost records show these differences and they are brought to the attention of the counties or districts involved, there will be a natural tendency on the part of the underdogs to want to improve their record. Thus the cost records serve as a stimulus to increased effort on the part of those who are responsible for the higher cost work. In short, competition is thrust into the picture and there is no gainsaying the value of competition.

I will cite an example of what competition between counties and districts has done to improve maintenance on federal aid projects in West Virginia. Prior to 1938 no records were compiled and no report was published to show the state-wide status of ratings on such projects. Beginning with the year 1938 the records were compiled and copies of the report were made available to all the county and district personnel. The average rating for West Virginia that year was 87.30. Each year thereafter we have publicized among our Counties and Districts a report showing the status of the maintenance ratings, and it is pertinent to note that there has been a steady improvement in the state-wide maintenance rating. The rating for 1944 was 96.34.

In my opinion, interest stimulated by competition was responsible for the improvement, and likewise cost records will furnish the tools with which to promote this helpful regional competition.

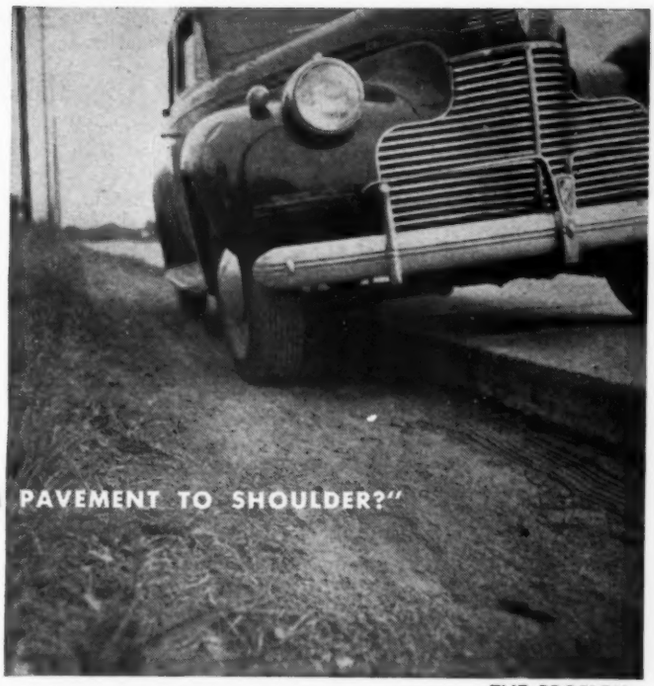
8. To determine administrative and overhead costs:

Administrative and overhead costs are as a rule closely scrutinized by state governmental officials and by legislators. Therefore it is important that such costs be available and at least reasonably accurate.

Administrative costs, being of a more or less regular and specific nature are usually rather consistent and reflect a fairly accurate charge; whereas overhead costs, because of the flexibility, and differences of opinions as to what constitute true over-

"Are any of your roads too narrow?

. . . OR HAVE THEY DANGEROUS DROPS FROM PAVEMENT TO SHOULDER?"



THE PROBLEM

Roads too narrow to carry today's fast-moving traffic safely and satisfactorily may be swiftly and economically widened with Tarvia* or Tarvia-lithic.*

The methods are simple and inexpensive, and there are combinations of Tarvia and aggregate which are adaptable to any kind of road and any condition of shoulder areas.

THE SOLUTION

Dangerous drops between pavement and unfinished shoulder are done away with, and the widening not only extends the life of the road but also increases the amount of traffic it can safely accommodate.

Why not check the narrow roads in your locality? The Tarvia field man can advise the proper shoulder foundations and wearing surfaces, and he will be glad to work with you.

THE BARRETT DIVISION
ALLIED CHEMICAL & DYE CORPORATION
40 RECTOR STREET, NEW YORK 6, N.Y.

New York • Chicago • Birmingham • St. Louis • Detroit • Philadelphia • Boston
Rochester • Minneapolis • Cleveland • Columbus • Toledo • Youngstown • Syracuse
Buffalo • Cincinnati • Bethlehem • Portland, Me. • Bangor, Me. • Norwood, N. Y.
Oneonta, N. Y. • Elmira, N. Y. • Cromwell, Conn. • Norwich, Conn. • Savannah, Ga.
In Canada: THE BARRETT CO., LTD. Montreal • Toronto • Winnipeg • Vancouver

Barrett Tarvia*
*Reg. U. S. Pat. Off.

head charges, may be made to reflect the will of those who are responsible for keeping them.

Therefore, I have never been convinced that overhead costs have much value unless a definite set of rules is followed in making the charges. The human element must be definitely restricted.

9. To enhance morale of state employes from the standpoint of conserving the taxpayer's money:

The keeping of a certain amount of cost data can always be justified, if for nothing else, merely for the moral effect it has upon the employes of a governmental agency, because many such employes had a "natural tendency" to feel that the "State" has unlimited resources, thereby eliminating the necessity for being frugal.

I'll grant you that the employes of a state government should be fully as careful with expenditures as are the employes of private industry, and every effort should be made to encourage thrift and efficiency, but you all know as well as I do, that the "natural tendency" mentioned above is quite a handicap to overcome.

Therefore, anything which tends to give the employes the impression that cost records are kept for the purpose of reducing costs and conserving funds has a definite salutary effect which is certainly worth while.

10. To furnish record for annual reports required by law:

It is customary in many states and mandatory in some that Annual Reports be published containing various data including cost data in order to provide a perpetual record of highway activities. Here there is no alternative but to keep and compile certain types of cost information. We find our annual reports very useful for reference purposes.

Value of National Records Limited

The desirability of standardizing the form or method in which cost data are kept and compiled is a matter which has been given a good deal of consideration, particularly by the Public Roads Administration, and I can understand why. This federal agency is interested, because standardized methods would certainly facilitate the comparing of maintenance costs in the various states. However, such comparisons between states, although interesting, *have little practical value because maintenance costs vary with climatic, topographic, material, labor and other conditions peculiar to individual states or groups of states.* They also vary with types of organizations and differences in personalities; therefore I cannot understand how such comparisons between states can have much useful value.

From the standpoint of individual states, standardizing the method of procuring and compiling cost data would be difficult to effect without also having uniformity in the types of organizations and in laws in the various states. The latter would be practically impossible to effect.

A group study of the cost accounting methods practiced in the various states might well serve to determine the best method, applicable to the State involved, in keeping and compiling cost data. There is one "best" method of doing almost everything and the determination of this "best" method is of tremendous import. The most practical means of making such a determination is through an exchange of ideas.

What Price Cost Data?

Concerning the expense justified in obtaining cost data: We must take into consideration the fact that voluminous cost records consume a great deal of time and effort, and that in too many instances no one ever looks at them or uses them after they are compiled.

Also, in many instances the time spent in keeping cost data could be used to better advantage in promoting more efficient methods of performing maintenance operations.

Furthermore, the actual keeping of many of the important details of cost must necessarily be delegated to men in the lower brackets of mentality and ability—men who can see no apparent reason for keeping such records, and who consider the effort expended an additional duty which is distasteful to them. For this reason there are bound to be discrepancies in the data collected, which in turn are certain to result in incomplete, uncertain and hence unmeaning figures at times.

Therefore, in my opinion, the expense which can be justified in obtaining cost data should be governed entirely by the need for the data, and the useful purpose for which the data are used. Personally I think the cost should be kept to the absolute minimum consistent with useful need and mandatory requirement.

▼

(*Continued from page* 79)

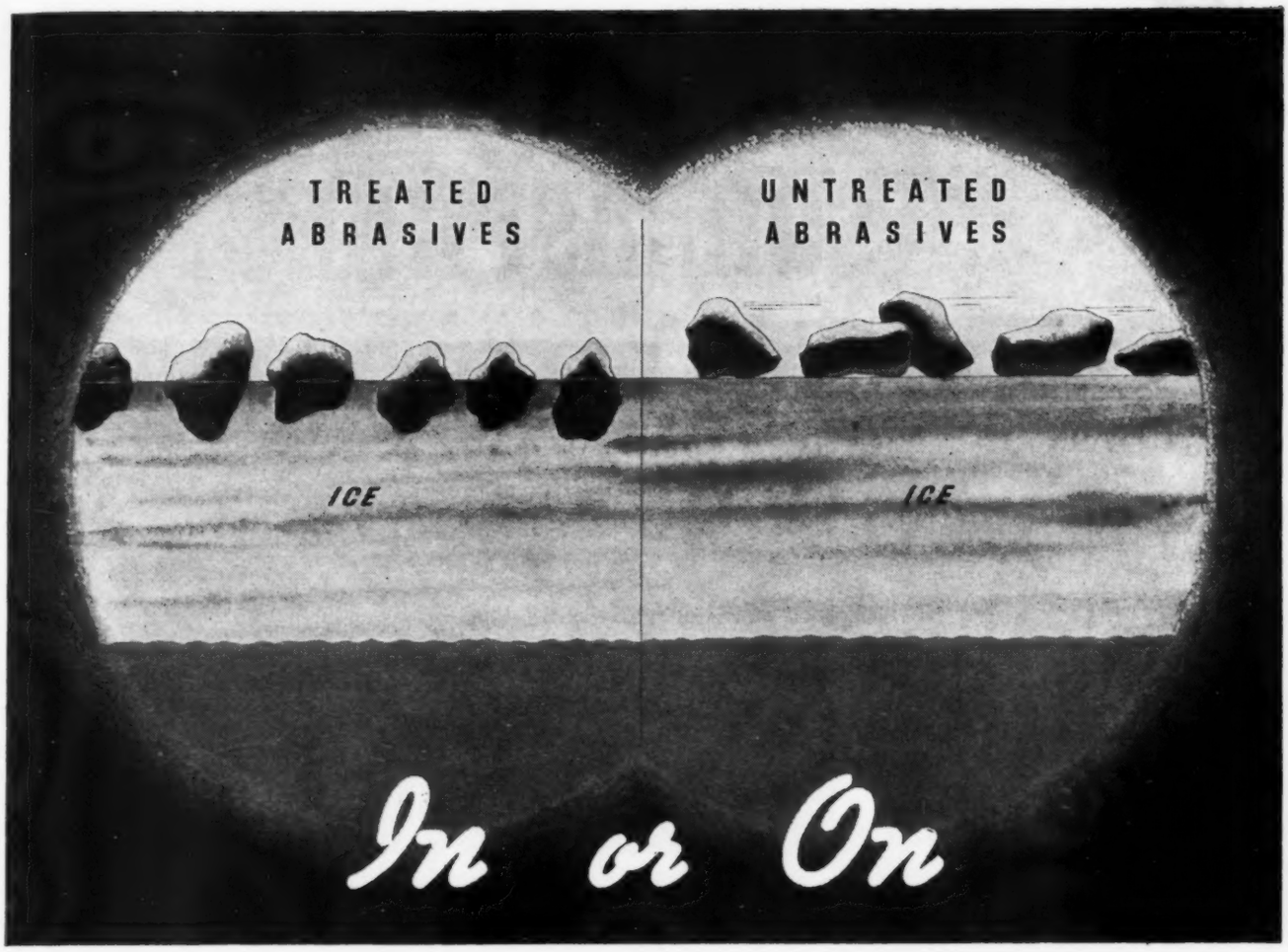
material situation showed that materials will probably remain 10% higher than prewar prices for several years. Equipment and parts will be approximately 20% higher in the first years after the war and then slowly decrease thereafter. Supplies, overhead, and general expense will probably remain 20% higher in the postwar period. Profits to contractors, which were extremely low in the 1939-40 period, will be from five to 15% higher than the prewar period. A summary of these items shows that probably the first year after the war construction costs in some cases may be as much as 30% to 50% higher than the depression period, which would be from 10% to 20% greater than the normal 1925-29 period. We know there have been certain advances in different items of construction since this 1925-29 period but some of these have been offset by increased efficiency in machinery and in the methods of doing work.

It seems that a state would be entirely justified to award contracts even when they are up to 30 to 40% increase over the 1941 price, or if they are not over 10% to 15% greater than the composite mile index obtained in the 1925-29 period. Therefore, it seems that before commissions reject bids for any highway construction a careful analysis should be made up by some such method as I have outlined. To do otherwise would be to defer our great highway program to a point where it will not provide the necessary facilities to meet the demands of transportation.

This, however, does not mean that contracts should be awarded promiscuously—even though we have millions to spend for highways, these dollars should be spent advantageously. It does not mean that we should delay the program while wishing for impossible prices. We should not use the depression period for our yard stick; but instead use the conditions that are current or that will result from measured factors that cause variations in costs.

The highway engineers and commissions have the greatest responsibility ever yet placed upon their shoulders. They should call for bids and then weigh the increased prices with the economic gains. The engineers are capable of making this analysis. They will know when to award, or reject, or call for new bids. If this is done the chances are that after a few starts, possibly awkward, the highway program will settle down and produce the highway facilities to meet the demands of traffic.

This great program can be carried on only with efficient and well-trained departments. To obtain these departments, the individual positions must be made attractive. This can be done with satisfactory salaries and assurance of continuity of engineering positions.



The Measure of "Grip" on Icy Roads

When grits lie loose on the ice to be easily brushed or blown away, they cannot do an effective or lasting skidproofing job. But when abrasives are treated with calcium chloride, they melt themselves into the ice, anchor themselves and really put teeth in the ice.

Automobile skid tests made under impartial supervision show that ½ lb. of abrasives, treated with calcium chloride, is as effective as 1½ lbs. of untreated abrasives. By saving two-thirds of your abrasives you save two-thirds of the cost of getting them out of the pit, putting them in piles, loading and spreading them. This means a two-third saving of manpower, equipment, tires and gasoline. Start now to save. Write for our Bulletin No. 27 "Skidproofing Icy Roads and Streets."

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Building • Detroit 26, Michigan

ICE CONTROL WITH
CALCIUM CHLORIDE
FAST • POSITIVE • ECONOMICAL

Gears Icy Roads to Tires

How Two Texas Roads Were Rebuilt and Widened with

SOIL-ASPHALT

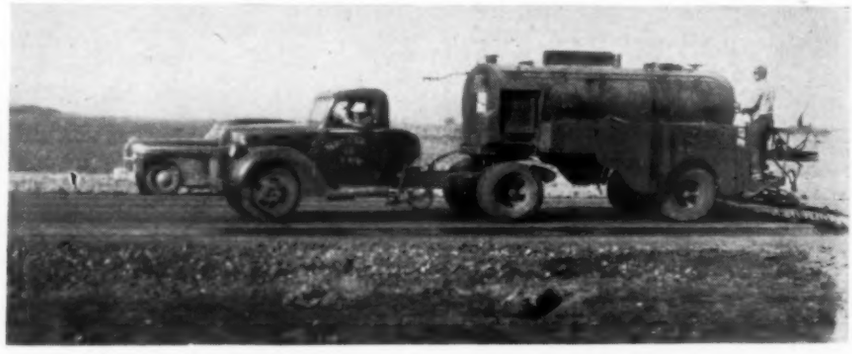
TWO noteworthy examples of the use of soil-asphalt mixtures were observed in Northeast Texas during 1945. These projects made use of selected sandy topsoil in the absence of local stone or gravel aggregate.

The jobs consisted of 12 miles of U. S. 69 southeast of Greenville, Texas, and 9 miles of state route 24, northeast of the same city. Texas Bitulithic Co., Dallas, held the contracts at $174,000 and $149,200, respectively.

The existing roadways consisted of 16-ft. width of stone that had been previously given some stone widening or shouldering. The problem was to reconstruct and widen these roadways. The construction procedure first contemplated was to trench out part of the old widening strip or shoulder for a width of four feet on either side of the original 16 ft.; build up these strips with three 2-in. layers of soil-asphalt mix; and resurface full width with a soil-asphalt binder course and a surface course consisting of 50% soil and 50% sand aggregate. This method was followed on the U. S. 69 project.

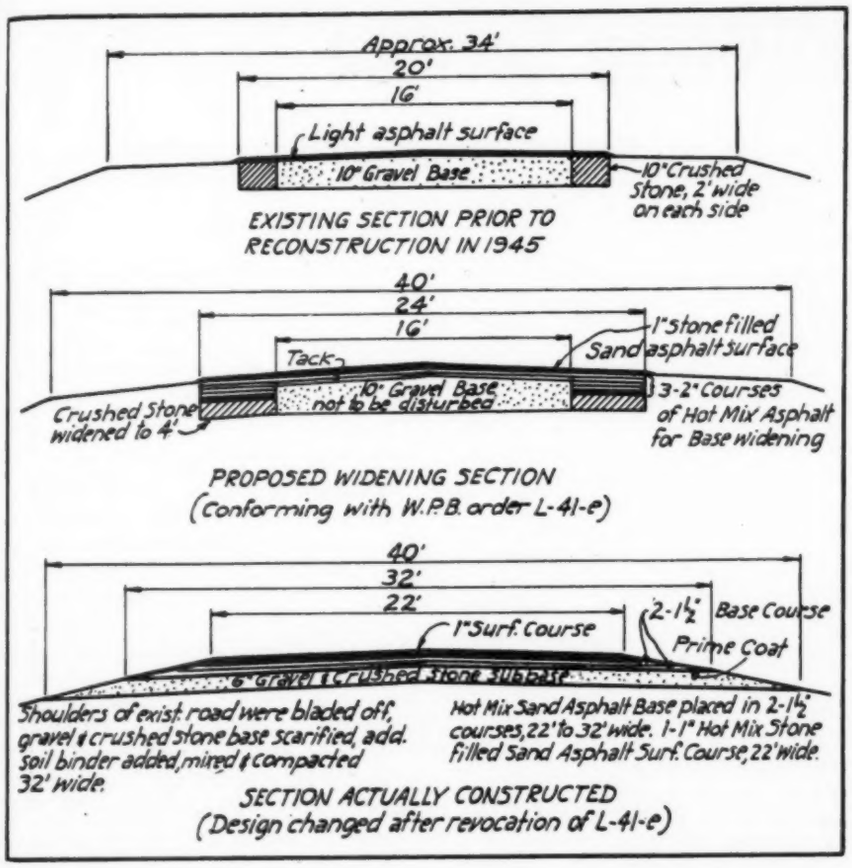
However, after further consideration at the time work began, a field change was adopted for the Route 24 job. The alternate procedure used (as shown in sketches) was to scarify the old road and blade the material out to 32 ft. width, adding some soil binder and recompacting. The reshaped base was given an RC2 prime (0.3 gal.) and sand cover to enable it to carry traffic during construction. Next came two courses of soil-asphalt mix, averaging about 3 in. combined thickness. This thickness was maintained for 24 ft. and tapered to zero in 3 ft. width on each side. A 1-in. (100-lb) surface course, using 50% sandy loam and 50% stone screenings in the mix, completed the job.

About 8% of 85-100 pen. asphalt was used in the hot mix, which was prepared for each project in a batch-type plant set up near the job. Two dryers were required to handle the sandy soil, the soil being quite wet during much of the working period. One dryer was cut out in dry weather. A belt conveyor was substituted for



★ Applying prime coat to gravel and crushed stone subbase

★ Finish machine placing second course of sand-asphalt base, showing tandem and pneumatic rollers being used for compaction. The two base courses each consist of 150 lb. per sq. yd. of sand-asphalt


Approx. 34'
20'
16'
Light asphalt surface
10" Gravel Base
10" Crushed Stone, 2' wide on each side
EXISTING SECTION PRIOR TO RECONSTRUCTION IN 1945
40'
24'
16'
1" Stone filled Sand asphalt surface
Tack
10" Gravel Base not to be disturbed
3-2" Courses of Hot Mix Asphalt for Base Widening
Crushed Stone widened to 4'
PROPOSED WIDENING SECTION
(Conforming with W.P.B. order L-41-e)
40'
32'
22'
2-1½" Base Course
1" Surf. Course
Prime Coat
6" Gravel & Crushed Stone Subbase
Shoulders of exist. road were bladed off, gravel & crushed stone base scarified, add. soil binder added, mixed & compacted 32' wide.
Hot Mix Sand Asphalt Base placed in 2-1½" courses, 22' to 32' wide. 1-1" Hot Mix Stone filled Sand Asphalt Surf. Course, 22' wide.
SECTION ACTUALLY CONSTRUCTED
(Design changed after revocation of L-41-e)

★ Cross section details of widening as proposed, and as finally used, on Texas state highway 24

the usual bucket-type cold elevator, belt fed by bulldozing the material into a trap. A tractor-drawn pulverizing mixer was used to process soil in the borrow area.

Compaction of hot-mix base was secured with one 3-wheel roller, one tandem roller and one pneumatic roller.

Screen analysis of the local sandy loam top soil, asphalt content of mix, specific gravity, density, etc., are as follows:

Screen analysis of soil (for base course):

Retained on # 10 sieve	0.3%
Retained on # 40 sieve	14.1%
Retained on # 80 sieve	71.7%
Retained on #200 sieve	95.9%
Passing #200 sieve	4.1%

Specific gravity of mixture (using 8% asphalt), 2.30; theoretical laboratory density, 85; road density, 80.

All of the above pertains to the hot-mix base course only, as the contractor expected to complete the base work before placing any of the stone filled sand asphalt surface course.

J. W. Cravens has acted as resident engineer on the two jobs which are carried out under James T. Pirie, district engineer, Paris district of the highway department.

Landscaping Made Integral Part of Planning

The highways of tomorrow in New York State will be built with two basic ideas in mind. Primarily the roads must be located and constructed to meet the requirements of traffic but they must also be made an integral part of their very surroundings. Such is the expressed policy of Nelson M. Wells, Principal Landscape Engineer of the New York State Department of Public Works. The ugly scars often left on the landscape as the result of construction work will be eliminated and instead grasses, herbs, shrubs, trees and vines which are native to the area will be planted.

Under the policy outlined by Mr. Wells the highway beautification program will begin not merely when the construction work is ending but rather in the period when initial plans are being made for new projects. Cooperative planning of the roads by location engineers, the landscape engineer and other departmental agencies to secure the most successful location and design of highways according to their use, their requirements, their environment and their land use and border development will be the order of the day.

"Highways should be adapted to topography in location, alignment, and profile to preserve natural ground forms and other natural features of vegetation, streams and shore lines," he said. "They must also take full advantage of scenic assets along the route and blend into the city and country surroundings. Such work should be constructed and maintained at a minimum of cost and should become an adequate service to the traveling public.

The principles involved in a program of highway beautification call for not only the flattening of new slopes but also the rounding and warping of their edges to produce a proper blending with the natural environment. Gentle slopes and natural land forms favor soil erosion control, better vegetative cover, longer sight distance for greater highway safety, greater beauty and lowered maintenance costs for erosion, mowing and snow-drifting.

"Initial costs may be somewhat higher than previously experienced," he said. "This will result from increased rights-of-way or easements which may also be required for the control of vistas, the preservation of fine trees and for other various landscape developments."

Initial steps in the planting program involve the establishment of vegetative cover on newly constructed and exposed earth surfaces. Early plantings serve two purposes, it was pointed out. They will check soil erosion immediately following construction, provide cover for earth scars and at the same time blend the work with adjacent growth.

From a utility standpoint, plantings may be designed also to feature seasonal displays of plant growth, to aid traffic from the safety standpoint or to establish shade or screens for objectionable landscape features. Selection of the type of vegetation used will be based on natural surroundings and the local requirements of soil and climate.

•

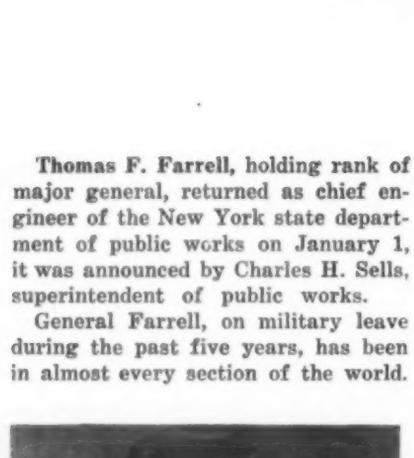
George E. Spargo, general manager of the Triborough Bridge Authority, New York City, has been appointed deputy mayor by the new mayor William O'Dwyer. Mr. Spargo will hold his present Triborough post and also continue the general managership of the New York City Tunnel Authority. Mr. Spargo is a civil engineer and long-time civil employee of the metropolis.

Back from Military Service

Two new state highway engineering chiefs are among road-builders returning recently to highway departments and contracting organizations

Thomas F. Farrell, holding rank of major general, returned as chief engineer of the New York state department of public works on January 1, it was announced by Charles H. Sells, superintendent of public works.

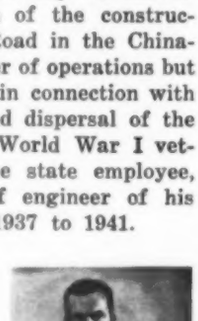
General Farrell, on military leave during the past five years, has been in almost every section of the world.



★ New York's newly returned highway chief, Maj. Gen. Thomas F. Farrell

He gained fame not only for his supervision of much of the construction of the Lido Road in the China-Burma-India theater of operations but also for his work in connection with the preparation and dispersal of the atomic bomb. A World War I veteran and long-time state employee, he served as chief engineer of his department from 1937 to 1941.

George S. Garman, recently appointed county superintendent of highways for Mercer County, Ohio, was a staff sergeant, 192nd Tank Battalion in the Philippines. He won a chestful of decorations including the Purple Heart, according to word from Ohio highway director Perry T. Ford.



George S. Garman

James R. Donaldson, captain with 3rd Army combat engineers, is now city engineer of Menomonee, Wisc.

Charles H. Hunnell, major, has returned to the Indiana state highway commission as an assistant engineer of road construction.

The South Dakota state highway commission now includes among its returned employees, **H. M. Sparks,** major, U. S. engineers, a former district engineer; **E. K. Morrell,** Captain of Engineers, who has become department construction engineer after service in the Pacific; **K. R. Scurr,** Lt. Col., 147th Field Artillery, now bridge engineer for the state after four years in the Pacific; and **Leo W. Fargen,** Major, 147th Field Artillery, returned as manager of the state-wide planning survey. Also **Leo A. Ihli,** captain, Marine Corps, who is an assistant maintenance engineer following hospitalization from wounds on Peleliu Island.

William S. Housee, Lt. Commander, has returned to the Michigan state highway department as a research consultant. He saw service with the Civil Engineering Corps, USNR, then in the Pacific where he served under the director of the Seabees.

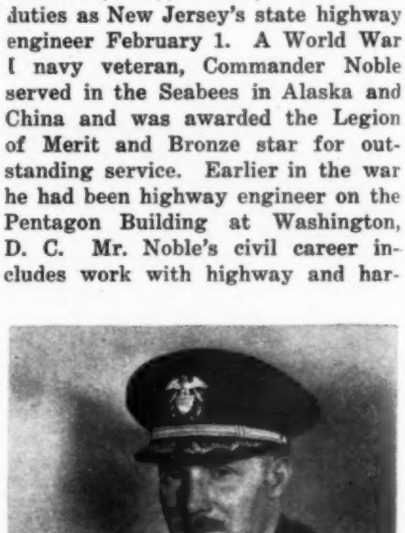
Howard S. Ives, assistant highway engineer, with the Connecticut state highway department, is back from a varied military experience. Entering the army as a 1st lieutenant, he became a lieutenant colonel, army engineer corps, having had charge of a combat battalion in Europe, after Australian and South Pacific service.

Charlson I. Mehl, formerly with the headquarters staff of Associated General Contractors, Inc., Washington, D. C., has returned to his old post. He served as a tail gunner (sergeant), was shot down and captured in Germany.

Lewis S. Graham, Capt., U. S. Engineers, has resumed his duties as co-partner in the general contracting and road building firm of W. E. Graham & Sons, Cleveland, N. Carolina. He rose in 20 months from the rank of private, and served with the 310th Engineers in Europe, winning a Purple Heart, Bronze Star and Silver Star.

Arthur A. Dobcon, Col., has returned from Shanghai, China, where he served as Chief of the Civil Affairs Branch on the staff of the H. Q., U. S. Forces China Theatre. He will return to his peace-time occupation as partner in the firm of Dobson & Robinson, Contractors, of Lincoln, Nebraska. Col. Dobson was awarded the Legion of Merit.

Charles M. Noble, recently Commander (CEC), USNR, resumes his duties as New Jersey's state highway engineer February 1. A World War I navy veteran, Commander Noble served in the Seabees in Alaska and China and was awarded the Legion of Merit and Bronze star for outstanding service. Earlier in the war he had been highway engineer on the Pentagon Building at Washington, D. C. Mr. Noble's civil career includes work with highway and harbor authorities in several parts of the country, service with the Port of New York authority, highway features of the George Washington Bridge and other projects in New York, and as special highway engineer on the Pennsylvania Turnpike. He is an authority on express highways.



★ N. J. state highway engineer, Comdr. Charles M. Noble

Wilton A. Snow, formerly manager, building contractors' division of A. G. C., is reported due home soon to this organization's staff. He has served as a lieutenant colonel in military governments in Europe and Africa.

FTC Holds Trade Practice Conference for Distributors

A Trade Practice Conference for the Construction Equipment Distributing Industry, under the auspices of the Federal Trade Commission, was held in the Edgewater Beach Hotel, Chicago, January 31. Commissioner Lowell B. Mason presided over an extensive gathering of the equipment distributors who stayed over from the AED annual convention.

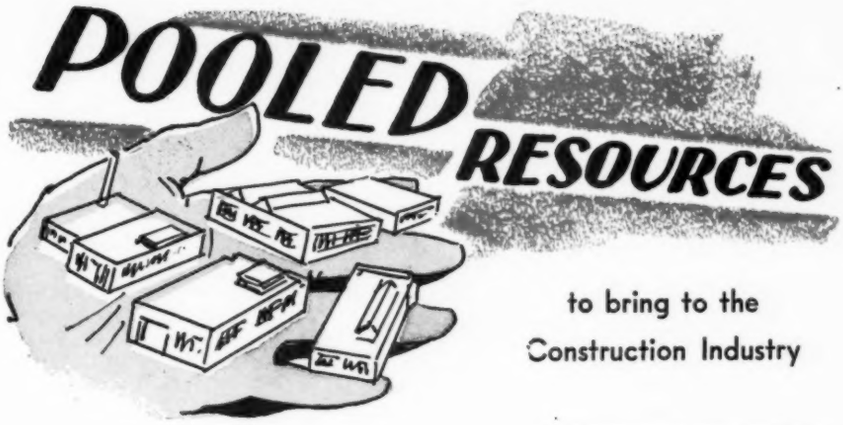
The purpose of the conference was to afford members of the industry opportunity to co-operate in the establishment, subject to the Commission's approval, of comprehensive fair trade practice rules designed to prevent unfair methods of competition and other trade abuses deemed harmful to the industry and purchasers. It has been authorized by the Commission at the request of, and in co-operation with, members of the industry in accord with the purpose of fostering and promoting fair competitive conditions in the industry and protection of the public interest.

Members of the industry submitted suggested rules for consideration at the conference.

After the conference at Chicago and before rules are finally approved by the Commission, the procedure in such matters requires that draft of rules in appropriate form be released from public notice to all interested or affected parties, who are thereby afforded further opportunity to present their views and suggestions and to be heard in respect to such proposed rules. Thus the views of all interested or affected parties receive full consideration before final Commission action is taken.

New York State Gets Going

Recent awards by N. Y. Dept. of Public Works include . . . relocation, 8.7 miles (Chenango County), $820,000, to Madison Construction Co. . . . grade crossing elimination (Westchester County), $324,000, to A. E. Ottaviano, Inc. . . . relocation and structures (Nassau County), $463,000, to Andrew Watson Co. . . . 20 miles road (Cattaraugus County), $354,000, to Warren Bros. Roads Co., . . . relocation, near Elmyra, $475,000, to Bere Engineering and Construction Corp. . . . 19 miles in Erie County, $498,000, to Louis Mayersohn . . . road job, Hamilton County, $647,000, also to Mayersohn . . . grading, Bronx River Parkway, New York City, $699,000, to Joseph Breen . . . reconstruction in Warren County, $743,000 to Lane Construction Co.



to bring to the Construction Industry

PROPER EQUIPMENT

ASSOCIATED EQUIPMENT DISTRIBUTORS

ASSOCIATED EQUIPMENT DISTRIBUTORS — AED — MEMBER

Banded together in a united effort to simplify the distribution and servicing of construction machinery—that is the purpose of the

ASSOCIATED EQUIPMENT DISTRIBUTORS

Wherever you see displayed the A.E.D. seal you know that here is a well-established, soundly financed organization of men who know equipment, and its application.

Here are engineers who can recommend the right machinery for the job — Service men, trained in factory methods of rebuilding and repair — Parts Specialists, who know what is available; how and when to recommend the making of critical parts.

Over 600 A.E.D. distributors located strategically, together with their many branches from coast-to-coast, will help make your equipment last until new machines are released.

Write for information about other A.E.D. Services.

BUY SAFELY - Buy from an A.E.D. Member

ASSOCIATED EQUIPMENT DISTRIBUTORS

1928 EYE STREET, NORTHWEST — WASHINGTON 6, D.C.

AIR POWER THAT BEATS SCHEDULES

On those jobs you win with a sharp pencil, there's no room for compressors and air tools that waste air or have a habit of quitting at the wrong time. Avoid interruptions and air-power losses by using Blue Brutes.

Let's take a 315′ Blue Brute Portable Compressor, for example. You'll like the way light, tight, quiet Feather* Valves help squeeze the most air out of each gallon of fuel . . . the way special unit coupling in 3-point suspension cushions engine and compressor against vibration, shocks, distortion . . . the way the smooth-running Diesel or gasoline engine drives the compressor. And especially will you like the way it powers such air tools as Rock Drills, Paving Breakers, and Wagon Drills.

If you don't know it already, it will pay you now to investigate why a Blue Brute air-power team beats construction schedules and keeps costs low by saving hours and dollars by speeding up the work. You'll find, as others have before you that in construction equipment *there's more worth in Worthington.*

*Reg. U. S. Pat. Off. H5-13A

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will gladly show you how Worthington-Ransome Blue Brute construction equipment will put your planning on a profitable basis and prove that *there's more worth in Worthington.* Act now! His name is listed on page **101.**

RANSOME EQUIPMENT

Blue Brutes include: Pavers, Concrete Spreaders**, Concrete Mixers, Concrete Placing Equipment, Big Mixers, Finishing Machines**, Pneumatic Placing & Grouting Equipment, Truck Mixers, Plaster & Bituminous Mixers, and related equipment.

WORTHINGTON EQUIPMENT

Blue Brutes also include: Diesel, gasoline and electric driven Portable Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs; Rock Drills and Air Tools in a wide range of weights and sizes; Contractors' Pumps**.

**To be announced

Get more WORTH *from air with* WORTHINGTON

BUY BLUE BRUTES

Compressors from 60 to 500 cu. ft. capacity in mountings to suit all jobs. Rock Drills and Air Tools that have always set the pace for easy operation — available in a wide range of weights and sizes.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division Holyoke, Mass.

Worthington-Ransome Blue Brute Distributors

See ad on page 100 for list of equipment in each line

Worthington-Ransome Distributors

Ala., Birmingham, J. D. Pittman Tractor Company
Colo., Denver, Power Equipment Company
Fla., Orlando, High Equip. & Supply Company
Tampa, Epperson & Company
Ga., Atlanta, Tractor & Machinery Company
Ida., Boise, Olson Manufacturing Company
Ill., Chicago, Chicago Construction Equipment Co.
Maine, Portland, Maine Truck-Tractor Company
Mich., Muskegon, Lakeshore Machy. & Supply Co.
Minn., Minneapolis, Phillippi-Murphy Equip. Co.
Mo., Clayton, The Howard Corporation
Montana, Billings, Interstate Truck & Equip. Co.
Helena, Caird Eng. Works
N. Y., Albany, Milton-Hale Machinery Company
New York, Hodge & Hammond, Inc.
New York, Railroad Materials Corporation
N. D., Fargo, Smith Commercial Body Works, Inc.
Okla., Oklahoma City, Townsco Equip. Company
S. C., Columbia, Smith Equipment Company
Tenn., Knoxville, Dempster Bros., Inc.
Vt., Barre, A. M. Flanders, Inc.
Va., Richmond, Highway Machinery & Supply Co.
Wisc., Milwaukee, Drott Tractor & Equip. Co., Inc.

Ransome Distributors

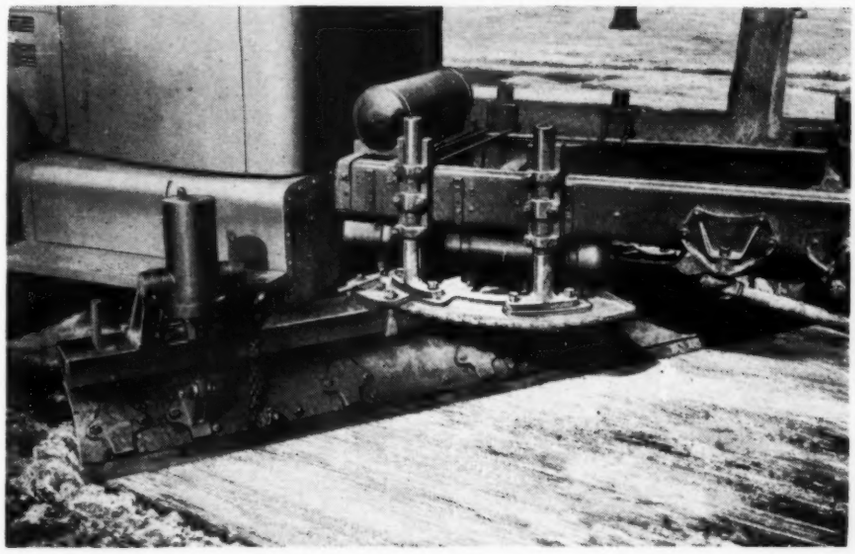
Ariz., Phoenix, Lee Redman Company
Ark., Little Rock, Kern-Limerick, Inc.
Calif., Los Angeles, Garlinghouse Bros.
Conn., New Haven, W. I. Clark
Waterbury, Contractors Supply Company
D. C., Washington, M. A. Doetsch Mach. Company
Ga., Savannah, Morgans, Inc.
Ill., Chicago, Thomas Hoist Company
Ind., Fort Wayne, American Steel Supply Co.
Ky., Paducah, Henry A. Petter Supply Company
La., New Orleans, Ole K. Olson Company
Md., Baltimore, Stuart M. Christhilf & Company
Mich., Detroit, T. G. Abrams
Miss., Jackson, Jackson Road Equip. Company
Mo., Kansas City, Brown-Strauss Corp.
Neb., Lincoln, Highway Equip. & Supply Co.
N. J., Newark, Johnson & Dealaman
N. C., Raleigh, Smith Equip. Company
O., Cleveland, H. B. Fuller Equip. Company
Pa., Philadelphia, Giles & Ransome
Wilkinsburg, Arrow Supply Company
Tex., El Paso, Mine and Smelter Supply Company
Houston, McCall Tractor & Equip. Company
San Antonio, San Antonio Mach. & Supply Co.
W. Va., Charleston, Clyde P. Beckner, Inc.

Worthington Distributors

Ark., Fort Smith., R. A. Young & Company
Little Rock, R. A. Young & Son
Calif., San Francisco, Coast Equip. Company
Colo., Denver, John N. Meade
Conn., Hartford, The Holmes-Talcott Company
Ill., Chicago, John A. Roche
Ind., Indianapolis, Reid-Holcomb Company
Iowa, Des Moines, Electric Eng. & Const. Co.
Ky., Harlan, Hall Equipment Sales Company
Louisville, T. C. Coleman & Son
Louisville, Williams Tractor Company
La., New Orleans, Wm. F. Surgi Equip. Company
Md., Baltimore, D. C. Elphinstone, Inc.
Mass., Cambridge, Field Mach. Company
Mich., Dearborn, Thomas G. Abrams
Detroit, W. H. Anderson Co., Inc.
Flint, Gransden-Hall & Company
Minn., St. Paul, D. L. O'Brien
Mo., Kansas City, Mach. & Supplies Co.
St. Louis, W. H. Reaves
N. J., Hillside, P. A. Drobach
No. Bergen, American Air Compressor Corp.
N. M., Albuquerque, Bud Fisher Company
Roswell, Smith Machinery Company
N. Y., Buffalo, Dow & Co., Inc.
New York, Air Compressor Rental & Sales
Olean, Freeborn Equip. Company
N. C., Raleigh, Caroline Tractor & Equip. Co.
O., Cleveland, S. M. Clancey
Cleveland, Gibson - Stewart Company
Marietta, Northwest Supply & Equip. Co.
Toledo, M. W. Kilcorse & Company
Oregon, Portland, Andrews Equip. Service
Pa., Allentown, H. N. Crowder, Jr., Inc.
Easton, Sears & Bowers
Harrisburg, American Equip. Company
Oil City, Freeborn Equipment Company
Philadelphia, Metalweld, Inc.
Pittsburgh, Atlas Equip. Corp.
Wilkes-Barre, Ensminger & Company
Tenn., Knoxville, Wilson-Wesner-Wilkinson
Tex., Dallas, Shaw Equip. Company
El Paso, Equip. Supply Company
Houston, Dye Welding Supply Company
San Antonio, Patten Machinery Company
Wash., Seattle, Star Machinery Company
Spokane, Andrews Equipment Service
W. Va., Fairmont, Interstate Engineers & Constr., Incorporated
Wyoming, Cheyenne, Wilson Equip. & Supply Co.

Buy Blue Brutes

Worthington Pump and Machinery Corp.
Worthington-Ransome Construction Equipment Division
Holyoke, Massachusetts



Michigan County Experience With Under-Body Blades

By A. L. Burridge
Consulting Highway Engineer,
Cadillac, Mich.

USE of trucks with their speed and adaptability was a factor in Michigan's excellent showing on county road maintenance during the war years. An experienced operator can blade 50 to 90 miles of road per day with the average truck when equipped with an under-body planer. The best results are obtained when the truck-planer combinations are able to get on the job immediately after a soaking rain has left the roads in a pliable, workable condition.

However, both earth and gravel roads have been bladed steadily regardless of the weather and this constant patrolling kept them in splendid shape. An example of a county user of this type of equipment is Delta County which under the direction of Superintendent and Engineer J. T. Sharpensteen, fitted a fleet of six trucks with the underbody appliances. Delta's road system encompasses 784 miles.

The success of under-body blades has been due mainly to two factors. First, insistence that the gravel used in road construction contain about 10% clay to act as a binder. Second, the manner in which the roads were worked with the planers until the clay was thoroughly mixed with the pebble. Michigan counties endeavor to patrol consistently after each rain, and where long stretches of dry weather are encountered a 5-ton per mile application of calcium chloride has been found to improve the situation considerably.

Winter Use, Too

Many counties in the state, especially in the northern portion, use the planers in winter, too. Carl Munsen, Wexford County Superintendent, says: "Our hills pose a serious problem in the winter months, particularly for heavy tractor-trailer outfits. We find that by starting our patrolling at the first sign of snow we can keep our paved roads bare with undertruck scrapers. We like these units because of their speed and because they scrape right down to the concrete without damage to either the road or the blade. We use one-way plows to follow the planers and push the snow from the shoulder back off the right-of-way."

Some counties reverse this procedure and follow a V-type plow with a planer equipped truck. The planer removes the residual snow and slush ridden over by the plow. This effort to keep paved road surfaces completely free of snow and slush-ice has very probably prevented numerous accidents, and the driving public profusely praises the elimination of this nightmarish driving hazard.

In addition to routine patrolling, the planers have been found to be adaptable to a variety of maintenance tasks. Experienced operators perform light grading as well as shoulder work with the units.

By placing your order for Steel Forms with us now, we can reserve the necessary steel for your spring requirements and we can make delivery on time.

If you delay, *the steel may not be available*, and we will be unable to assure you satisfactory delivery.

Heltzel makes flexible and rigid steel forms for building concrete curbs, combined curb and gutter or sidewalk, also steel forms for modern highway and airport construction.

FULL INFORMATION HERE!

B-19 STANDARD ROAD FORMS | B-19-A DUAL ROAD FORMS | A-20-F STREET FORMS

Send for your copies; mailed promptly upon request

Heltzel
BUILDS IT BETTER

- BINS, Portable and Stationary
- CEMENT BINS, Portable and Stationary
- CENTRAL MIXING PLANTS
- BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
- BITUMINOUS PAVING FORMS
- ROAD FORMS (with lip curb and integral curb attachments)
- CURB FORMS
- CURB AND GUTTER FORMS
- SIDEWALK FORMS
- SEWER AND TUNNEL FORMS
- CONCRETE BUCKETS
- SUBGRADE TESTERS
- SUBGRADE PLANERS
- TOOL BOXES
- FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO. WARREN, OHIO · U. S. A.

Mail Inserted Card for Equipment Data

Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our Postwar Parade beginning on page 116, for which a numbered reply card has been inserted to help you request data on items that interest you.

4-Lane Highways Small Part Primary System

Only 6 per cent of the 333,000 miles of primary rural highways have more than two traffic lanes, it was emphasized by Charles M. Upham, engineer-director, American Road Builders Association, at a recent highway conference in Washington, D. C. Excerpts from his address follow:

In 1943, we had only 20,879 miles of roads with more than two lanes, and of this mileage, 14,661 were only three lanes which when approaching full capacity can be extremely dangerous.

America's mileage in more than two lane highways is far more limited than most people realize and much of this is not of a high type surface. Only five states—Kansas, Minnesota, Nebraska, New York and Texas—have in excess of 1,000 miles each, and the predominance of this is of the 3-lane variety. In fact, deducting the 3-lane mileage, Kansas has only 93 miles of 4-lane or more, Minnesota 253, Nebraska 31, New York 567 and Texas 617.

According to Public Roads Administration reports for 1943, released this year, we have 5,191 miles of 4-lane highways, 736 miles of 5-lane highways and 291 miles of 6-lane highways in our primary rural highway system. Thus it will be seen that the 4-lane thoroughfares are only .015 per cent of the total mileage. In arriving at this percentage, we have not considered the 28,932 miles of urban highways which are extensions of the primary rural highways. This inclusion would naturally lower the percentage still more.

1945 Traffic Toll: 29,000 Deaths

More than 29,000 dead and a million injured, is the traffic toll estimate for the past year made by the National Safety Council. November's recorded deaths were up 40% over the previous November; October's up 53%. About two-thirds of the deaths occurred in rural areas.

Improving

Engineer-Contractor Relationships

3—Steps in a plan by which a supervisory employee can improve his handling of problems on the job. The previous installments discussed the importance to the engineer of developing skill and tact in personal dealings, and the first step, fact gathering.

By H. K. Glidden
Eastern Editor, Roads and Streets, New York, N. Y.

Step II. Weigh and Decide

IT is difficult to place the proper emphasis on each phase of the solution of a complicated problem. Step I is basic. Step II is no less important and probably far more difficult. Judgment and experience come into play more and more in Step II. The owner will seldom appreciate the effort expended in Step I. He will be more likely to recognize the value of the getting the whole story when Step II goes sour because Step I was neglected. Skillful weighing and deciding on the basis of the facts at hand is an art, and the engineer who does this job well is rightfully termed an artist. At this point in the solution of the problem, the engineer is starting to paint his picture of the project by the use of plans and specifications. He is roughing in the outline. Scope and proportion of the picture must be good or the relationship with the contractor will be bad.

(a) Fit the Facts Together

Fitting the facts together is the process of drawing up the notes, assembling the data where it can be reviewed in its proper perspective, consolidating reports, boiling the material gathered down to its essence. This action is routine, but must be done with care. Each distinct phase of the problem can be likened to a jig-saw puzzle. Step I supposedly gave the engineer all the pieces. Fitting them together is difficult, but properly done, the engineer will have either a complete picture of the particular phase of the problem involved or a definite indication that some of the facts are yet to be obtained. It should be relatively easy to determine the various phases of the problem which in themselves should present a complete picture such as subgrade conditions, topography, available construction materials, heating requirements, drainage, water supply, etc.

Sub-head (a) requires the engineer to fit all of the facts he has at hand into such form as will allow him to study them readily without his having to refer to such a maze of notes and reports as to make proper correlation impossible. Some facts lend themselves readily to transformation into drawings and graphs, others can best be set forth in the form of concise factual reports. Combining all of the so-called jig saw puzzles into a bound volume properly arranged and indexed, will in most cases expedite the work called for under the next sub-head as well as provide a record.

(b) Consider Their Bearing on Each Other

Sub-head (b) calls for considering the bearing of each fact on all of the other facts which is in effect evaluating the importance of each of the facts as it is related to the problem. The engineer is weighing facts at this stage of the game, placing himself in a position to make the decision most certain to accomplish the objectives set forth. Quite often the determination of the most desirable action requires a good deal of cutting and trying. A proper understanding of the bearing of the various facts on each other and on the ultimate objectives will reduce the number of tries required to a minimum. Conferences and discussions are now in order as prior to this point it will have been almost impossible to have considered a composite fact picture. The engineer's reputation with the owner is more involved at this point than is his relationship with the contractor. Both, however, are involved and much depends on a proper consideration of the bearing facts have on each other.

(c) Check Practices and Policies

Checking practices and policies in a proper manner will save the owner money and the contractor grief. Contractors like everybody else get used to performing work in a more or less standard manner. Their equipment has been assembled to do things a certain way. Their key men know their job best when they are repeating some previous performance. Unless the owner has a good reason not to do so, or is willing to pay the difference, standard practices and policies should be followed. Find out what they are for the given locality. An engineer will do well to realize that nowhere in the United States do people keep on building anything of the same materials or in the same manner for any appreciable length of time, if such a procedure results in an unusual percentage of failures or is not satisfactory to them. Nearly any given job can be done several different ways with the same net result. Hesitate before you specify aggregate sizes not available locally, materials foreign to the local industry, procedures which require experimentation and trial by the contractor, or the use of specifications which require research by the contractor before he can submit an intelligent bid. Be progressive, but don't just be different. Have a good reason whenever you depart from standard practices and policies.

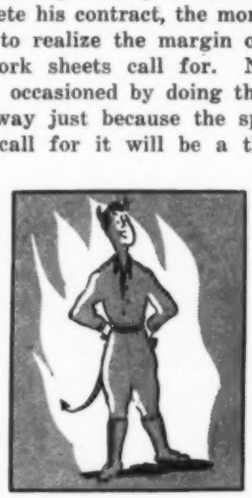
EDITOR'S NOTE: This is the third installment of Mr. Glidden's timely and thought provoking article, which will be concluded in an early issue. Write the Editor of "Roads and Streets," 330 So. Wells St., Chicago, if you are interested in a few reprints or a specific quantity.

(d) Determine All Possible Actions

Following the plan proposed, the engineer now has his facts fitted together and has evaluated them. He has checked practices and policies. Now he must begin to make decisions. He has to decide what possible courses of action are open to him. Many engineers are prone to see only one possible action. The improved engineer won't rush this part of the task assigned to him. He will look for at least two solutions and possibly more. He will be guarding himself against the second guessers. The engineer will be able to rule out any number of possible actions as being impractical although completely possible. It is not intended to make this step a process comparable to a game of anagrams, but rather that it should be an unbiased attempt to see the picture from more than one angle. Careful consideration of this step will provide the answers to a lot of questions which may be advanced later by the owner, the user or the contractor. To be able to state that any given solution or some variation of it was considered and discarded for specific reasons will create a favorable impression on most people. A written report of this phase of the solution is advised, as it may prove to be of considerable value if difficulties arise later. The actual preparation of this report also tends to make the engineer more positive that all possible solutions have been found. It is a natural tendency for engineers to hesitate to prepare or sign anything of which they are not certain.

(e) Consider Effect of Each Possible Action on the Owner, User and Production

Having arrived at one or more possible ways to accomplish the result the owner expects of him, the engineer will have to evaluate the possible actions against his objectives. This can best be done by considering the effect of each possible action on the owner, the users, and production. If the owner is also the user, his personal likes and dislikes assume more importance than will be the case where the owner has a profit motive, or is a public agency. In any event, the owner employs the engineer, and therefore deserves prime consideration. The user of the finished product, whether the owner or a lowly taxpayer, will eventually express more opinions than anyone else. The engineer should give a great deal of consideration to the interests of the user of the product, as the owner's profits, or the politician's votes are directly involved with the user's reaction to the finished product. The word production as used herein concerns the contractor and the length of time required to complete the project. Good production costs less thereby saving the owner or the public money. The shorter the length of time required by a contractor to complete his contract, the more likely he is to realize the margin of profit his work sheets call for. Needless delays occasioned by doing the job a hard way just because the specifications call for it will be a thorn in



★ Project engineer—prince or devil?

the contractor's side, and certainly won't improve his relationship with the engineer. Difficult production procedures make for difficult inspection as any contractor will try short cuts in such a situation.

(f) Decide on Action to Be Taken

It is believed that the engineer's decision as to the action he will take to solve his problem will be arrived at with relative ease provided all the previous steps have been carefully followed out. He has the whole story fitted together so that he can readily consider the bearing of one fact on another, has evaluated the facts involved, checked all applicable practices and policies, determined all possible actions and has considered the effect of each possible action on all parties involved. It will be unusual if one of the possible actions does not show a marked advantage over the others being considered. It may happen, however, that two or more possible actions present distinctly desirable aspects. Such a situation usually calls for the inclusion of each desirable alternate type of construction in the proposal with the final decision delayed until it can be reached on the basis of actual cost to the owner. The exercising of a person's judgment is a purely personal thing and the engineer will be entirely on his own when he makes this final determination. The exception to this statement will be such instances as the owner making a definite selection from the possible actions proposed by the engineer and even in such exceptions the responsibility for the outcome rests with the engineer.

DON'T JUMP TO CONCLUSIONS. At this point the engineer should review everything accomplished to date. The facts may now assume a different aspect, some part of Step I or Step II may have been slighted, or conditions may have changed somewhat. Forever beware of jumping to conclusions, as most people do not have what it takes to admit a mistake and back up to a fresh start. The natural tendency is to bull the thing through depending on alibis to cover up previous neglect or bad judgment.

Step III. Take Action

Steps I and II have been largely ground work. The time has come to take action. Taking action must be an orderly process and requires further good judgment on the part of the engineer. Step III has a wider scope than Steps I and II. The word "action" is herein construed to cover the actual preparation of the plans and specifications as well as seeing construction to completion.

(a) Can You Handle This Yourself?

The number and mental caliber of the specialists under the supervision of the engineer can vary from practically none to the possibility of his having too many. He must decide whether he can handle this problem with his own organization or whether he needs help in handling some phase of the work. Failure to take advantage of the services of either paid consultants or consultants whose services are available without charge, from Federal, State or other agencies, will quite likely result in increased cost to the owner, as well as an inferior product and poor relations with the contractor. As an executive, the engineer will wisely delegate responsibility and will recognize that no man can be a specialist in more than a very limited number of fields. If he determines that some phases or all the work requires talent not presently available to him, he will either employ additional help with specialized training, secure additional equipment or arrange for securing the services of a consulting firm. His decision as to whether he should build up his own organization or employ a consultant should be governed by the likelihood of his encountering similar projects which will continually require a larger organization as well as by the relative cost and expediency of each procedure.

(b) Time Your Action Properly

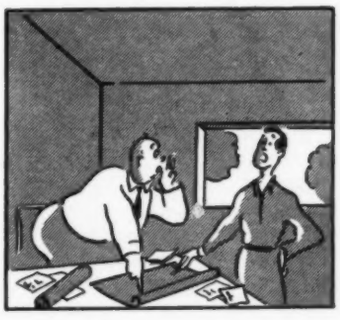
Having secured the facts, weighed them and reached a decision as to

the action to be taken, and having determined how the work is to be handled, the engineer must decide when to take the action. With the exception of rush projects, the engineer will have considerable latitude in the matter of setting the date when bids are to be received and the time the work actually will be performed. For certain types of projects in any location, and a far larger number in favorable climates, timing is of little importance as far as construction difficulties are concerned. However, in most instances working conditions, conflicting labor markets, availability of materials and the convenience of the users will dictate an auspicious date for completion of the project. A good assessment of the factors involved in this sort of timing will save the owner money, preclude criticism by the contractor and should result in heightening the esteem accorded the engineer. Another consideration the engineer should give to timing is the matter of choosing the time when his organization will be in the best position to get out the plans and specifications. On many projects the completion date will be sufficiently flexible to allow for them being placed in the category of a backlog of work available to keep the engineer's staff occupied during slack periods. All too frequently an engineering office has either a feast or a famine. It is too often true that this situation is directly traceable to a lack of planning on the engineer's part. More consideration to timing of the preparatory field and office work will improve most engineers.

The previous paragraph deals for the most part with timing the work so that the project gets on the market for bidding at the proper time. Let us now consider timing in regard to action taken on the job in the actual inspection of construction. I have found that contractors complain particularly when the engineer uses poor timing and any of the following things happen:

1. Work isn't laid out or staked when he is ready to start.
2. The inspector is not available when a decision must be made on some phase of the work.
3. Advance notice of changes or revisions isn't given.
4. Estimates are delayed.
5. Notice of defective workmanship or materials isn't given promptly.

Constant attention is required to properly time all of the activities involved in the inspection of work under construction. In many instances more than one contract is awarded to accomplish a single project. Nearly all specifications allow the engineer some control over the timing of the various phases of the work being performed under each contract. Proper phrasing of the specifications so that each contractor understands when and where the other contractor will be working, will allow each contractor to properly evaluate the working conditions he can expect to encounter and submit his price accordingly. After award of the contracts, the engineer must coordinate and time the various activities so that the intent of the contract specifications is carried out and arguments and delays thereby avoided. It is often extremely difficult to anticipate job conditions, with the result that in many instances the specifications do not fully cover the situation in spite



★ Facts help resolve differences

of the best intentions on the engineer's part. Even in this situation proper planning and timing of such things as notices to proceed and stop orders will enable the engineer to make the work progress smoothly and go a long way to alleviate difficulties from any unforeseen job conditions.

Needless cost to the owner can be avoided and good engineer-contractor relationships can be maintained by timing conferences and special inspections so that they take place when the matter to be looked into is hot. Poor decisions may result from the premature scheduling of action of this kind, and unnecessary delays and confusion usually result from delaying the action too long.

In spite of the most careful planning, a large percentage of projects involve changes in the scope of the work. The terms of the contract usually anticipate this possibility and provide for the proper handling of the costs occasioned thereby. However well the contract is written a disagreement often arises between the contractor and the engineer as to proper payment for the change. Timing often governs the extent of such difficulties and has a great deal to do with the final outcome of the disagreement. Giving the contractor as much prior notice as possible regarding the nature and scope of a change will usually result in the change costing the owner less, and will expedite final completion of the work. This action on the engineer's part also increases the possibility of settling the matter immediately on a friendly basis. Every effort should be made to settle the cost of the change prior to its accomplishment or at least immediately after it has been completed and figures on costs compiled. Claims arising from changes, or for any other reason, which are not settled immediately and are allowed to drag out after the project is completed or allowed to go to the court of claims, usually reflect to the discredit of the engineer. Such delayed settlements have a habit of resulting in a distortion of the facts, hard feelings arising between the individuals concerned, the final decision being made by someone who had no direct connection with the project, and the financial settlement being widely in favor of the party presenting his evidence in the most clever manner. Engineers are usually at a disadvantage under such circumstances, as for the most part their training and experience is not such as to allow them to cope on an even footing with good legal talent. If the engineer is unable to secure agreement on the cost of a change immediately, he can time his activities so as to stand him in good stead later. Prompt factual reports and records of costs and construction activities submitted at the proper time will prove to be good evidence. Such timing and handling of the matter, regardless of the final decision, will gain the engineer the respect of the contractor and the owner.

The engineer will do well to apply all of the points of Step I to the procedure he uses in settling claims, at the same time paying particular attention to timing. Always handle such matters while they are hot.

Periodic and final estimates are extremely important to contractors. Their ability to meet payrolls, discount their bills, and maintain a good financial standing often depends on their receiving prompt and accurate estimates. The engineer-contractor relationship is definitely involved in the manner in which the engineer handles and prepares his estimates. Proper timing of his own activities and the activities of the engineers under his supervision will in most instances result in the contractor receiving a fair estimate within a reasonable length of time after the end of the period which the estimate covers.

Proper timing of every activity required of the engineer on the job cannot be stressed too heavily if good engineer-contractor relationship is to be maintained. The owner is also vitally concerned. Construction projects move with varying speeds, but all of them move on toward completion. Some phases of the work are visible for inspection at certain times and thereafter are concealed and only in specific instances can these parts of the work be uncovered without a good deal of work. Proper timing of all job inspection insures the owner good results, protects the contractor against having to do the work over or uncover it for inspection, and enhances the reputation of the engineer. Tardy inspection of materials often results in the contractor having to revise his schedule, usually an expensive procedure for him, because materials he counted on using at a certain time are rejected so late they can't be replaced by the time they are needed.

Engineer-contractor relationships have gone sour in many instances because construction stakes were not set at the proper time. Contractors, for the most part, seem to have an utter disregard for the work involved in setting stakes and, therefore, knock them out at the least provocation. The engineer has this matter under control if his specifications properly evaluate the job conditions and provide for an equitable penalty being assessed against the contractor to cover the cost of resetting stakes needlessly displaced. The problem of the proper time to set stakes is not an easy one to solve, but its complications can be reduced to a minimum provided the engineer devotes proper attention to timing this job properly.

(c) Should You Refer This to Your Supervisor

Previously, I have said that a problem would be considered to be "any project or portion thereof assigned to the engineer for accomplishment" and as you no doubt have noted hypothetically applied the solution to an entire project and have outlined the plan as applied to the chief engineer. This manner of presenting the solution has been for convenience of the writer with no intention to imply that the plan is not considered applicable to each and every engineer regardless of his relative position in an engineering organization. The owner or his counterpart in public works has been assumed to be the supervisor of the chief engineer. In the application of the plan to the engineers working at various levels under the chief's supervision such engineers will have to determine in their own mind whether or the actual owner or one or more of their supervisors is referred to when the word "owner" is used.

Supervisors hold their positions because of their ability to supervise the activities of the employees under their jurisdiction. As is indicated by the efforts of the U. S. Civil Service Commission and other employers to train and improve supervisors, there exists supervision ranging from poor to excellent. All supervisors have some traits in common. One of these common traits is their dislike for being bothered with details and the presentation to them of a half baked solution or idea. The writer has seen the proper presentation of material to a supervisor described as "Completed Staff Work" and defined as follows: "Completed Staff Work is the study of a problem, and presentation of a solution, by a staff officer, in such form that all that remains to be done on the part of the head of the staff division is to indicate his approval or disapproval of the completed action." All engineers will do well to study this definition of "Completed Staff Work" and apply it to their tendency to take things up with or refer them to their supervisor. An engineer should apply all of the steps of the plan given herein to the solution of the problem, studying it and restudying it until the best single proposed action is evolved and then present this action to his supervisor or the owner. He must resist the temptation to ask his supervisor what to do or present his solution piece-meal, as to succumb is to demonstrate that he doesn't know his job. The engineer may and should, as required, consult other engineers, but it is his job to work out the details no matter how complex they may be. This advice as to referring things to a supervisor is considered to be sound no matter what the caliber, likes or dislikes of the supervisor or owner may be as anyone in a supervisory position will soon appreciate and approve being protected from partially completed solutions, long winded memoranda and immature oral presentments. However, this advice is not intended to advocate arriving at a solution on the basis of incomplete information. Step I (d) may call for conferring on more than one occasion with the supervisor or owner, but only for the purpose of gaining all the facts and not for the purpose of his working out the details of the solution. Before a solution is presented, the engineer should give it the final test which is: If he were his supervisor or the owner, would he be willing to sign a contract or other binding documents or stake his professional reputation on the solution being correct. If the answer is "no" he should take it back and work it over until the answer is "yes."

(d) Don't Pass the Buck

"Don't pass the buck" is good advice couched in general terms. Specification writing offers ample opportunity to pass the buck, and far too often specifications are written on that basis. If Step I of the plan is followed out carefully there will be less of a tendency on the part of the engineer to write the specifications in such a manner as to leave it up to someone else to figure out details, methods of payment and the meaning of ambiguous phrases. Passing the buck in specification writing probably results in as much damage to engineer-contractor relationships as any one other mistake the engineer can make. The engineer often finds himself with a contract containing ambiguous phrases, or contradictory specifications and drawings, which fail to make clear such things as the scope of some phase of the work, or how special items of work are to be paid for. This same contract will probably contain clauses allowing the engineer to do most of the interpreting of the intent of the plans and specifications, and it is only natural that the engineer protects himself and the owner, with the contractor receiving the least consideration. On the other hand, buck passing plans and specifications afford unscrupulous contractors an opportunity to press unjustified claims. In either case, relationships are usually bad. An engineer's reliance on such phrases as "common practice," "as found necessary or desirable," "satisfactory to the engineer," is for the most part buck passing. The improved engineer will know the whole story so well that he can be specific regarding all of the work he expects the contractor to perform for the price bid. The improved engineer will never intentionally pass the buck. If there are phases of the work about which he is uncertain, he will either clear them up before awarding a contract, or else so word his specifications that the bidders are aware that an uncertain condition exists and will be handled in a prescribed manner, such as cost plus or a revised quotation when the uncertain conditions have been cleared up.

Following Steps I and II together with carefully using the best judgment and timing will preclude the necessity for buck passing. A good rule will be to back up and review Steps I and II whenever the old familiar buck passing phrases start to creep into the specifications. DON'T PASS THE BUCK!

Larger Shop Space

This Contractor's Answer

Geo. M. Brewster & Son, Inc., rearranging and enlarging headquarters shop to 40,000 sq. ft. this winter.

ARE the larger contracting firms in line for a volume of work comparable to that of the war years? The owners of Geo. M. Brewster & Son, Inc., of Bogota, N. J., think so, judging from their shop plans. This outfit, fresh from a remarkable wartime record of heavy airport grading and other big war construction jobs is currently enlarging and rebuilding what was already one of the most extensive headquarters shops maintained by any eastern contractor.

Brewster's headquarters facilities at Bogota, N. J., in recent years has included an asphalt plant, shop yard, and two adjoining repair buildings in addition to a spacious modern office structure. One of these buildings has been given over to truck and engine repairs and the other to tractor and other heavy equipment.

The modernization program calls for knocking out walls and joining the two nearby buildings into one carefully planned layout providing shop floor space of some 40,000 sq. ft., as against about 25,000 sq. ft. of previous space. Rear doors leading in from the yard will be enlarged, for quicker entry and exit of equipment. Repair space is to be arranged for utmost convenience and access from the stockrooms, all special rooms being located around a large general repair room.

Some features to be included are:

1. A preliminary cleaning rack on which all incoming equipment is given a high-pressure going over with hot water.

2. A modern steam cleaning room where units or parts get a high-pressure solution washing. This room, 75x75 ft. in area, will have latest washing equipment and ventilation. Steam will be supplied from a 300-hp. boiler, installed previously to serve the asphalt plant and general shop needs.

3. An enclosed room for motor testing, with the specialized equipment needed for precision testing of the types of motors on which the company intends to concentrate.

4. A separate, well-ventilated room for welding.

5. Another room for servicing high-pressure pumps, in recognition of the specialized attention such equipment deserves.

6. Spaces allocated respectively to motor overhauling, the "iron shop" (machine and forge shop), tires and batteries.

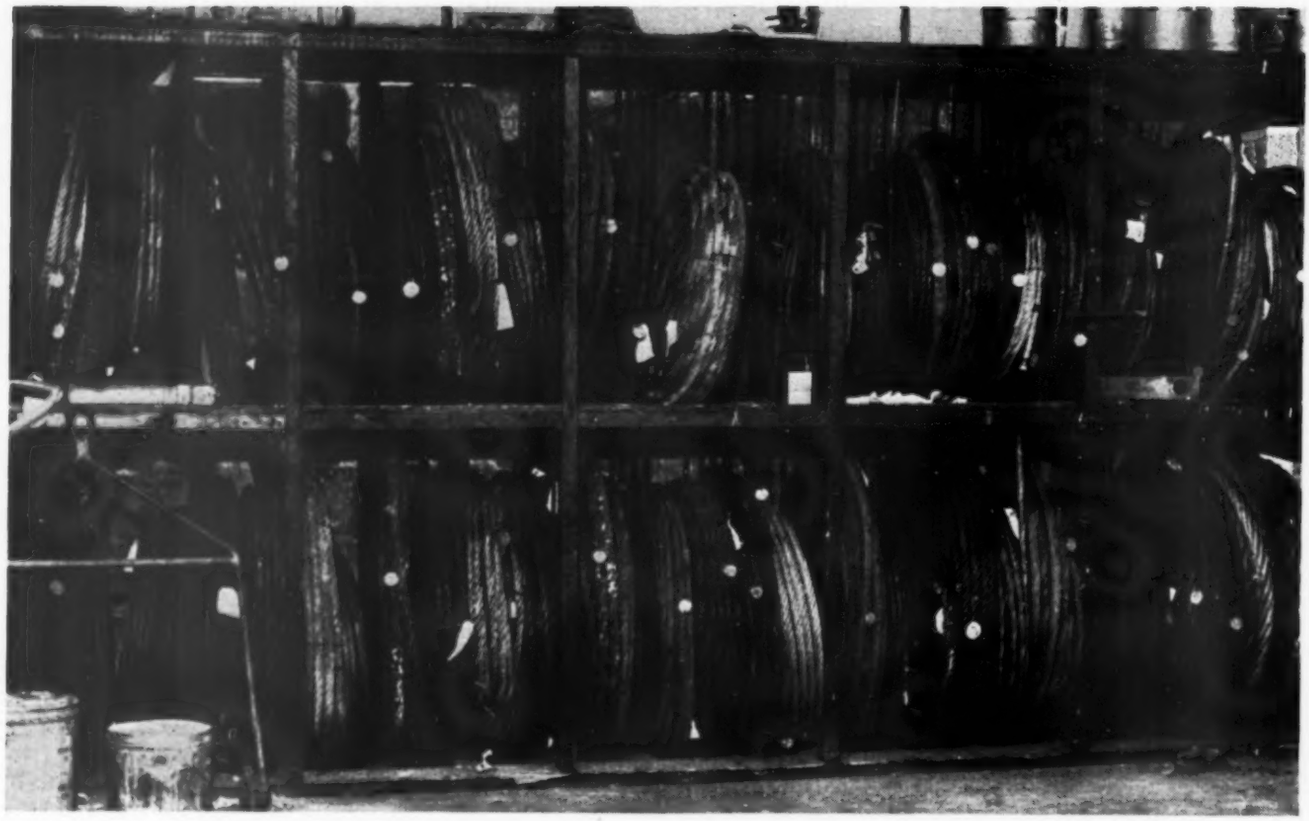
7. A special area is reserved for shovel repairs, and other space will be equipped with tractor equipment including power track repair equipment.

8. A central tool room, replacing present scattered allocation of tools.

Continuation of the company's present extensive parts warehouse, maintained under a perpetual inventory system. Tractor and shovel parts are to be kept in separate stacks or bins from the supply of general and motor parts.

9. Modern sanitary facilities for shop employees and drivers, including toilets, showers, lunchroom. As with other contractors, Geo. M. Brewster & Son, Inc., has an eye on holding overhead to a minimum. General machine shop equipment such as lathes are not to be in evidence, since commercial machine shops and equipment distributor shops in the vicinity can

★ Trundle buggy for scrap—two discarded dump buckets on a "wagon," which is towed around the shop and yard by a light wheel-tractor. Helps Brewster keep a neat looking place



★ **Replacement Cable Coming Up!** In this rack Geo. M. Brewster & Son, Inc., keeps preformed cable of the various sizes and types needed on its shovels, cranes and draglines—all cut to length, coiled, tagged, and ready to ship out when the hurry call comes

Time and Labor Saving Kinks

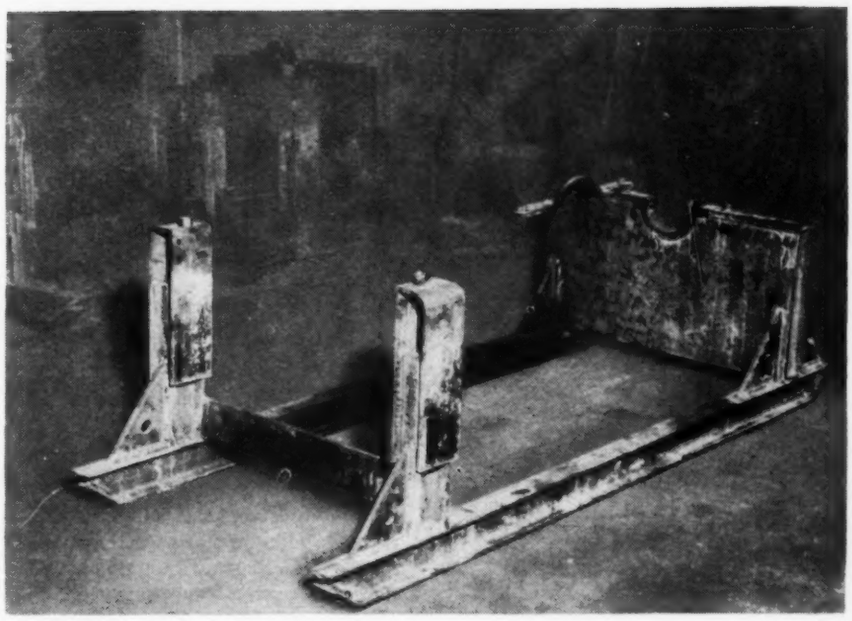
seen in the shops of Geo. M. Brewster & Son, Inc.

★ A modern hydraulic press in Brewster's shop is put to a wide variety of uses—here pressing a bushing out of a tractor track roller

perform such service quickly and economically. One handy unit owned, however, is a threading machine, for bolts up to 2½-in. diameter. Tire repairs likewise will be limited to tubes.

Labor saving devices will be applied to the utmost, however. For example, modern shop presses, jacks and hoists. An overhead gantry crane will perform heavy hoisting, while most ordinary hoisting, including removal and transporting of truck engines, will continue to be done with chain hoists mounted on heavily built frames which move about on the shop floor.

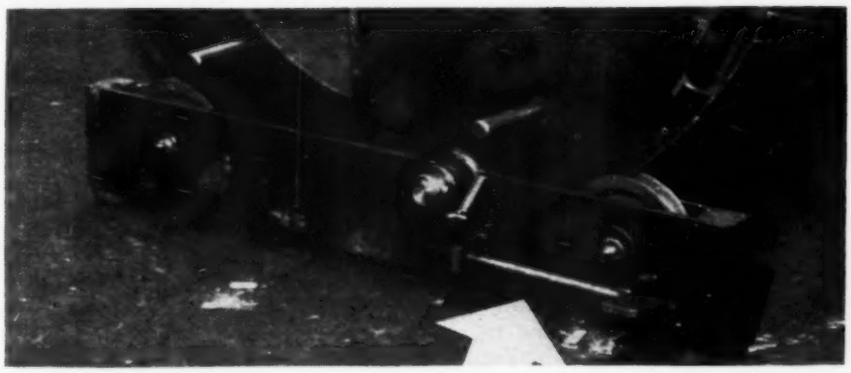
The Brewster firm, of course, follows custom in setting up field shops on large jobs. But its practice has been to bring all engines in to Bogota for overhauling or major repairs. The shop men have designed and built motor stands for the principal types of motors owned. Motors are trucked or shipped to and from the job securely bolted to these stands, which have proved very successful in avoiding damage to motors enroute.

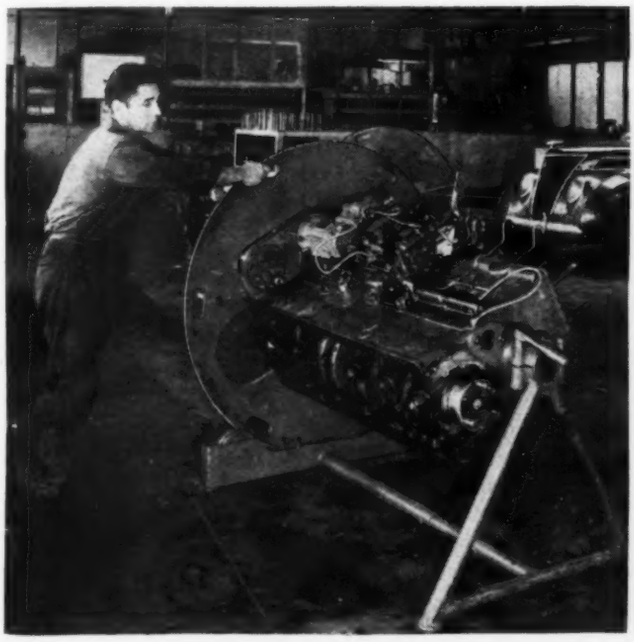


★ One of several shop built steel motor bases, used by Brewster in transporting truck engines between the job and the overhauling shop

★ Stand for Diesel Engines

One of several motor stands, made as an aid to speedy overhaul of Cummins engines, this one being a shop-built duplicate of stands available from the engine factory. These stands cradle the engine in a welded pipe frame at the front end and a revolving plate at the transmission end. (Note the cut-out, into which the engine casting exactly fits.) The plate is supported on sheaves in the plate base. The engine can be rotated to any position by grasping one of the slots on the circular plate. Since the two main photos were taken a foot-pedal device (arrow) was installed to operate a pin which slips into one of several holes in the plate and thus locks the motor in a desired position





How to Make
Rope Splices

Presented here is a discussion on how to make the three splices most commonly used by construction men: the Eye Splice, the Short Splice, and the Long Splice. This article appeared in "The LINE" published by Line Material Company.

The Eye or Side Splice

WHEN it is desirable to have a permanent eye at the end of a rope, it can be formed by splicing the end of the rope into its side, thereby making an eye or side splice.

To make this splice, unlay the end of the rope about six turns. With the Marline spike, raise one strand of the rope at the point where the side splice is to be made. The larger the eye, the farther down the splice must be made. Next tuck any one of the loose strands through the opening, diagonally upward to the right. Call this strand No. 1 (Fig. 1). Strand No. 2 is then tucked under strand "b" (Fig. 2) of the main rope in a similar manner. Strand No. 3 is likewise tucked under strand "c" of the main rope in the same direction as the other two strands. To do this turn the splice away from you as shown in Fig. 3. When this is done strands are pulled in tight.

Next, pass each of the loose strands over the strand of the main rope nearest to it and under the one beyond. Always tuck the strands in rotation, one tuck at a time. Continue this until you have made at least three tucks. If it is desirable to taper the splice, cut away some of the fibres in the strand after each tuck is made. A finished Eye Splice is shown in Fig. 4.

Short Splice

When it is desirable to splice together two ropes which are not required to pass over a pulley, a short splice can be made. This splice can be made quickly, and is nearly as strong as the rope. As the diameter of the rope is nearly doubled, this type of splice is too bulky to pass through a sheave block.

To make the splice, unlay the ends of the two ropes for about six turns and dovetail the ends. Then make one tuck with each set of loose strands. Do this at least three times to insure maximum strength. If a taper is wanted, add one or two extra tucks at each end and cut away one-half of the fibres of each strand for each tuck. These steps shown, Figs. 5, 6 and 7.

Long Splice

When two ropes are to be spliced together so that they will pass through the original set of blocks, the long splice must be used.

To make the long splice, unlay one strand of each rope for ten or twelve turns. Lock and draw the ends of the ropes tightly together, as shown in Fig. 8, making sure that strands A and B are side by side. Using care to see that the ends of the rope do not separate, unlay strand A from its rope and follow it with strand B. Keep B tight and pull it down firmly into A's place. Continue this until about seven inches of strand B remains, as illustrated in Fig. 9.

Now untwist C, D, E, and F and lock them as shown in Fig. 10; C between D and F and F between C and E. Strand D is now unlaid toward the left and strand C is laid in its place. Strand C replaces D to the left, just as strand B replaced A to the right. Be sure that D is unlaid, not F. The replacement of D by C continues until C is about seven inches long. At this point, the breaks in the strands are separated by about nine inches, as indicated in Fig. 11.

The break between E and F is in the middle of the splice; A and B at the right and C and D at the left.

The next operation, shown in Fig. 12, is to tuck the strands at each break. To do this the long strands must be cut so that they are about seven inches long. To begin the tucking operation, tie each pair of strands together with the first half of a square knot. This will prevent the unwinding of strands from the rope. Each knot must be pulled down into the rope as sketched at 3 in Fig. 12.

Each strand is then tucked in twice as is done in making the short splice. These steps, Fig. 13 and Fig. 14.

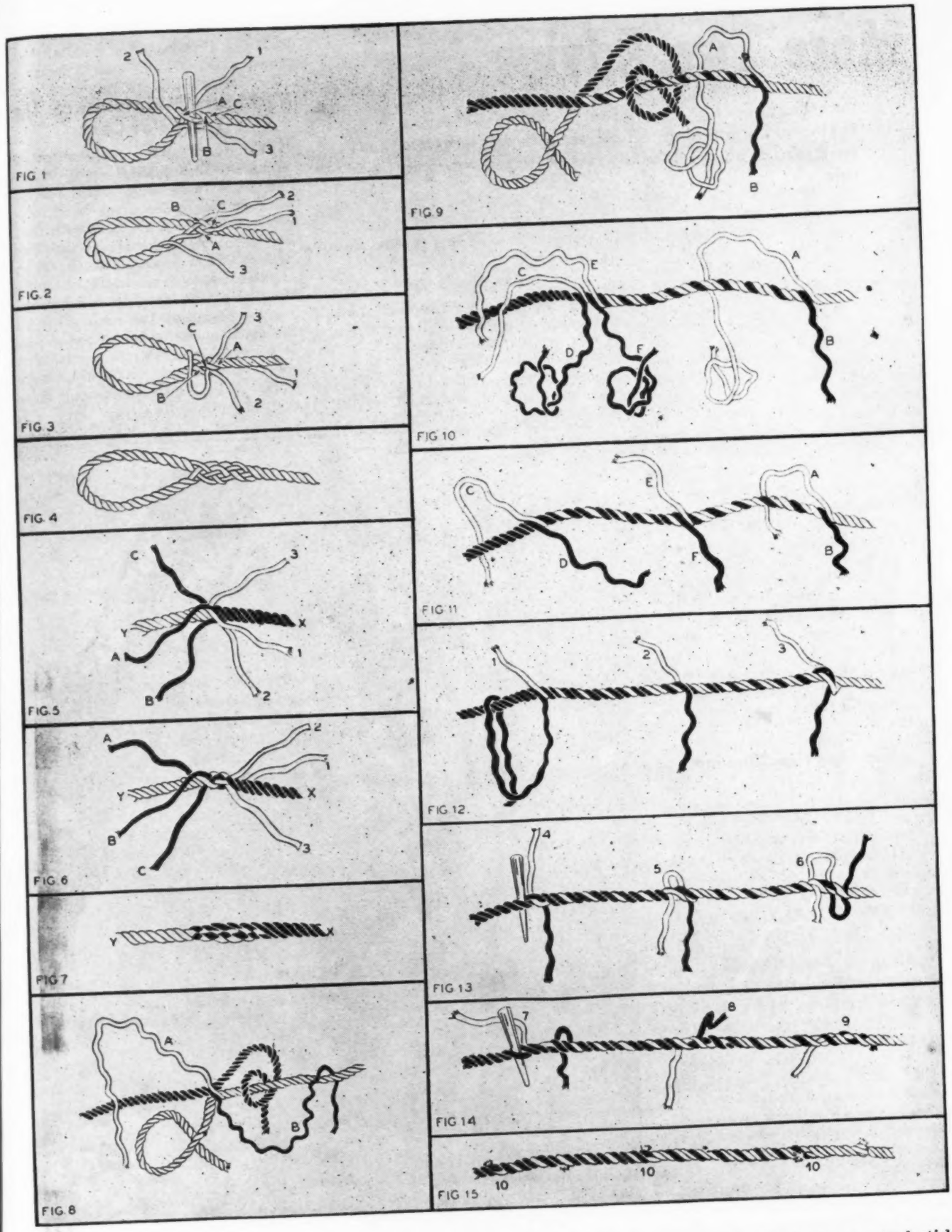
If each strand is untwisted a little before it is tucked, a smoother job will result, as a loose strand will flatten out and conform to an oblong

New Jersey Planning $120,000,000 Freeways

New Jersey has a 120-million-dollar plan for building Route 100, a freeway, from the George Washington Bridge at New York, to New Brunswick; and for Route 4, a parkway from this bridge south to Cape May. In a recent public meeting, New Jersey highway commissioner Spencer Miller, Jr., made it clear that the state's road job is two-fold. It must catch up with the 15-year accumulation of general highway improvements, and it must build expressways of a high order, of which these two projects will be the most important.

Miller said that unless something is done quickly in his state traffic problems will become far worse and the cost of making the improvements will be greater than they are now. By 1970, he said, the present peak traffic on some of the main highways will have been trebled and quadrupled and if new highways are not built it will take longer to go from Jersey City to Woodbridge than it once took by stagecoach.

"We knew what we needed in 1930," reminded Miller, "but the depression came along and held us up. Just as we got ready for action again the war came along and put a stop to construction." He said North Jersey has been losing population in the same ratio that Westchester and Long Island have been gaining, mainly because it has no adequate highway system to take people quickly to the urban centers.



opening, and a tight strand requires a round opening. By doing this the diameter of the rope is reduced.

Tapering can be done by making two extra tucks and cutting away some of the fibres from each strand after **each extra tuck.**

Fig. 15 shows the completed splice. After the splice has been completed, the ends should be cut one-half inch long. As a final step, a round stick should be used to pound down each part of the splice. Follow this by rolling the splice underfoot. This makes the splice more compact and pliant.

More Tire Advice

According to Kieth Thompson, LeTourneau Service Engineer, determining the correct tire pressures for each job can be simplified by observing a few simple rules:

First—always make sure you use tire pressures that are within the range specified by the equipment manufacturer. Minimum and maximum pressures are specified for each size and ply of tire under the loads hauled in each machine, and it is important you stay within these established limits. (Refer to equipment instruction manuals, or to tire inflation charts issued by tire manufacturers.)

Second—to determine which pressure within the specified tire range to use, look over the job conditions. If operating in wet, soft or sandy soil, lower tire pressures should be used to obtain needed traction and flotation. For well-maintained haul roads where less traction and flotation are required, higher pressures should be used in order to reduce rolling resistance and tire maintenance cost. When operating in areas where the tires may become damaged or bruised by running over sharp rocks, snags, etc., lower pressures should be used in order to minimize damage to the tires.

Watch for Tire Slippage

On traction tires, watch for tire slippage on the rim when operating with the tires inflated to pressures in the lower part of the recommended tire pressure range. Experience with synthetic tires has shown that they must sometimes be inflated to slightly higher pressures than natural rubber tires of the same size, to prevent slippage on the rim.

Both the effect of tire pressure on tire maintenance cost and on production must be taken into account in determining the correct tire pressures to use. If, for example, reducing tire pressures would increase production, but at the same time increase tire maintenance cost, it would depend on which is the more important on this job—cost or production—as to whether reducing tire pressure would be advisable.

A thing to remember on self-powered scrapers is to keep the two drive tires inflated to equal pressures and the two rear tires likewise inflated equally. The only exception is when equally inflated drive tires cause the machine to continually pull to one side, due to the tires being slightly unequal in diameter of tire wear or tire "growth."

Don't Bleed 'Em

The practice of "bleeding" tires (deflating tires whose pressure has increased because of heat) is not recommended. This results in increased flexing which continues to increase the heat and build up the pressure. Underinflation results when the tires cool and may lead to damage.

Michigan Maintenance Up Forty Per Cent

During 1945 some 2,380 miles of Michigan's 9,400 miles state trunkline system were improved by special maintenance projects. Over $3,000,000 was expended by the department on special resurfacing and patching projects and a total of $10,500,000 on maintenance as a whole. This makes the third straight year a record amount of money has been spent by the department for maintenance. In both 1944 and 1945, the department spent $10,500,000 on maintenance work. This is some 40 per cent more than in any previous year.

★ What! Drop Stone This Far?

No, this operator isn't trying to wreck the wagon by dropping stuff from high in the air. In fact, the stones aren't dropping at all. They aren't stones to begin with, but fragments of busted-up concrete pavement held together by reinforcing wire. This trick photo is taken from the files of the Ohio department of highways

Roadside Development Conference at Columbus

February 27 and 28 are the dates set for the 5th Annual Conference on Roadside Development, held under sponsorship of Ohio State University, Columbus, Ohio. The program theme is "highway design—its relationship to the roadsides; to the countryside; to economic public use and enjoyment." The announced subjects include: good roadside engineering design; the public's use of the roadsides; limited access highway design; design in relationship to economy of maintenance, and safety to the public; new developments in weed control.

For further details apply to Mr. Charles R. Sutton, Department of Agriculture and Landscape Architecture, The Ohio State University, Columbus 10, Ohio, or Mr. Dallas D. Dupre, Jr., Landscape Architect, Department of Highways, Columbus 15, Ohio.

New Jersey Budgets 48 Million for New Roads

A budget of $48,987,000 for new highway construction for the year ending July 1, 1947, was submitted to state authorities by highway commissioner Spencer Miller. Under the program planned, $32,200,000 would be contributed by the state and the remainder by federal funds; $8,450,000 would go for right of way.

This is in addition to an operating budget submitted of $12,901,000 for the same period, $5,000,000 higher than the present year's. This sum will provide for hiring 877 new employees and fill 393 vacancies, and for certain reconstruction, maintenance and equipment expenditures.

TRANSITS and LEVELS

HEADQUARTERS for REPAIRS – any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalogue RS-91 of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

WARREN-KNIGHT CO.
Mfrs. of Sterling Transits & Levels
136 N. 12th St., Philadelphia 7, Pa.

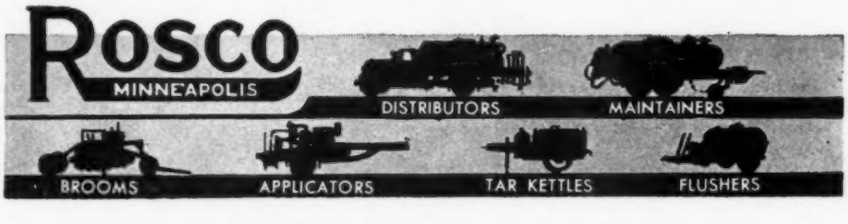
The success of highway, street and airport construction and maintenance depends largely on MEN and MACHINES. Our objective is to produce machines of dependability and performance to protect your reputation.

THE ROSCO BITUMINOUS DISTRIBUTOR now in use on both continents, makes new friends every day. It provides *coverage where coverage counts.* The Pressure Control Method accurately applies bitumen from as little as 3/100 gallons per square yard and up. And it automatically compensates for any changes such as application rates and spraybar length.

The Rosco Master Control Valve serves you these seven ways: Starting spray . . . circulating . . . loading . . . transferring . . . pressure control . . . clean out . . . no-drip cut off. The front mounting of this valve, along with engine and pump, provides a safe, roomy rear platform, and balances the load. The folding type spraybar, also original with Rosco, is equipped with four sections, vertical lift and shift and horizontal bar pivot. These and many other features are explained in Rosco literature. See your Rosco dealer, or write us for details.

ROSCO MANUFACTURING CO.
3118 SNELLING AVE. • MINNEAPOLIS 6, MINNESOTA

ALLIED EQUIPMENT MANUFACTURERS ASSOCIATED AEA MEMBER



Dean Steinberg Strengthens Latin Ties

Dean S. S. Steinberg of the College of Engineering of the University of Maryland returned recently from a goodwill tour of Latin America, where he made a survey of engineering schools in the other American republics on a trip sponsored by the U. S. Department of State. He visited institutions and conferred with engineers in Colombia, Ecuador, Peru, Chile, Argentina, Uruguay, Brazil, Venezuela, Panama, Costa Rica, Mexico, and Cuba.

The other purposes of his trip, according to Dean Steinberg, were to establish closer relations between the engineering educators of Latin America and those of the United States, as well as between their respective engineering societies; to arrange for exchange of professors; and to provide for a wider interchange of engineering and technical literature.

For this trip Dean Steinberg was designated the Official Representative of the Society for the Promotion of Engineering Education, whose membership includes all engineering colleges in the United States and Canada; and Official Representative of the American Society of Mechanical Engineers, as well as the American Society of Civil Engineers.

During the course of his trip Dean Steinberg was made an Honorary Professor of the University of Ecuador; an Honorary Member of the Cultural Institute of Ecuador; and Special Representative to the United States of the Union of South American Engineering Associations, as well as of the Association of Engineers and Architects of Mexico.

OTC
MAINTENANCE TOOLS
RUGGED TOOLS for TOUGH JOBS
DEPENDABLE heavy duty tools for pulling and installing bearings, gears, sleeves, wheels, shafts and other close-fitting parts. Made of high alloy, drop forged, heat-treated steels, precision machined—strong, easy to handle, portable, SAFE to use, FAST-working! Approved by Hyatt, M-R-C, New Departure, SKF, Timken, and by Tractor Manufacturers.
OTC PULLERS and Attachments, BOX WRENCHES and other tools in sizes to handle practically every maintenance job.
FACTORY APPROVED CATERPILLAR SET
Essential service equipment for all CATERPILLAR Tractors; also used on other tractors and on road machinery. Other sets available to meet your needs.
Write for OTC Maintenance Bulletin showing many time-saving OTC uses.
OWATONNA TOOL CO.
319 Cedar St., Owatonna, Minn.

Roads and Street Debts Cut One-Third

State, county and local road and street indebtedness in Minnesota has been reduced in three years to two-thirds of the pre-war total, according to data gathered by the Highway Planning Survey, joint agency of the U. S. Public Roads Administration and the State Highway Department. Outstanding highway and street indebtedness totaled $39,675,944 on Dec. 31, 1944, a reduction of $19,533,919 from the $59,209,863 total on Dec. 31, 1941.

State highway indebtedness, including county reimbursement bonds, was reduced from $33,054,583 to $22,125,000 in the three-year period. The counties reduced their road and bridge indebtedness from $8,502,128 to $5,029,270. Township road debts were reduced from $1,946,134 to $1,555,003. Municipal street indebtedness was reduced from $15,707,018 to $10,966,671.

The reduction was made possible largely by the general drastic curtailment of construction during the war years, and it was effected in spite of the substantial decline in current revenues.

Ruling Upholds Washington State Bid Policy

The state highway department practice of determining the amount of a bid on a highway project, by a summation of the unit prices, complies with the law, Attorney General Smith Troy of Washington state ruled recently. "Your refusal to consider a bid unaccompanied by the full 5% deposit would not be at variance with the law," Troy told highway director Clarence Shain. "It is our view that the sounder theory and more recent cases require a strict compliance by the bidder and allows the exercise of no discretion in waiving that requirement.

POWER'S CATALOG SCORES AGAIN!

"Best Ever" Sums up the gist of the comments from the users of the 1945 edition of Powers' Road & Street Catalog

SPACE NOW BEING SCHEDULED

For

1946 EDITION

HAVE YOU MADE RESERVATION?

READ WHAT THEY SAY

CONTRACTORS:

"Used by purchasing agent, office staff, outside superintendent and field manager."
"A constant reference book and very helpful."
"Very useful to us, being roads, streets and airport builders."
"Very important and much used in our work."

SERVICE COMMANDS:

"Contains information of extreme value to Field Service Engineers of this headquarters."
"Used as reference for procurement, as reference by engineer training staff, and as a text reference for student officers course."
"Equipment specifications very useful to Army Engineer Battalion. The only publication I've found where they are all in one place."

FEDERAL ENGINEERS:

"A big help in selecting materials, etc."
"Very valuable information and very handy."
"Will be used throughout Navajo Reservation, total area 25,000 sq. miles."

COUNTY ENGINEERS:

"Has been and is now in use weekly. Would not be without it."
"Hard to get along without it."

STATE HIGHWAY ENGINEERS:

"A lot of valuable information when needed."
"Used as reference book in engineering department."

CITY MANAGER:

"We find the Catalog very helpful."
"Very convenient."

FROM OVERSEAS:

From Purchasing Commission USSR—
"Proves very helpful in contacting suppliers of different types of road building equipment."
From Contractors' Agent, England—
"Keeps us up-to-date on latest methods and machinery used in the United States."
From Foreign Economic Administration—
"As many as possible will use it in Poland and Czechoslovakia where I expect to take it soon."

Published by GILLETTE PUBLISHING CO.
330 South Wells St., Chicago 6, Ill.
NEW YORK CLEVELAND LOS ANGELES

NEW EQUIPMENT AND MATERIALS

Postwar Parade

of New Construction Equipment and Materials

Equipment Cleaning Unit

1. A new multiple-duty steam cleaning unit has been developed by Oakite Products, Inc., New York. This unit is a self-contained, down-draft flame, oil-fired, enclosed coil-type steam generator that delivers hot vaporized cleaning solutions under selective pressures up to 200 lbs. A wide range of fuel oils may be used to operate the unit. Due to its flexibility of steam pressures, the unit may be used on many different types of light and heavy-duty cleaning. Many new, exclusive features are stated to be incorporated that provide for simplicity and ease of operation and maintenance, rapid steam generation, unusual solution tank capacity, effective

Oakite Vapor Cleaning Unit

operation of two steam guns simultaneously, wide flexibility in its application to various cleaning operations, safety against fire and other advantages.

•

New Street Lighting Fixture

2. A new fixture for secondary street lighting has been placed on the market by Westinghouse Electric Corporation, Pittsburgh, Pa. This new reflector is enameled porcelain and consists of a circular flat dish in which is a deep oval indentation. The lamp, instead of projecting below the plane of the reflector, is mounted up in the oval hollow, so that no light is thrown above the horizontal. The reflector is so shaped as to capture a high proportion of light and to cast it where needed, i.e., on the road. About 60 per cent more light is stated to fall on the actual roadway than with previous open-type lamps. Contributing to the high utilization factor is scientific use of the specular reflection of porcelain enamel.

•

New Air Separator

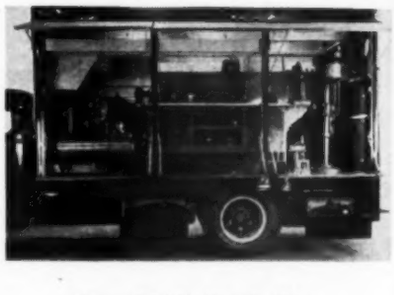
3. A new separator for removing moisture, oil, scale, etc., from compressed air has been introduced by The Swartwout Co., Cleveland, O. Utilizing the centrifugal principle the new product features simplicity of construction and operation and highly efficient separation. Air entering the inlet is diverted positively to the inner wall of the round body and unwanted substances whirl out of the air stream and drain to the bottom. The cleaned air may be taken off horizontally or vertically from pipe-tapped ports. An integral float-operated trap releases condensate automatically.

•

Portable Machine Shop

4. Production of a truck-mounted repair shop for use of contractors, highway departments and concerns operating over extended areas has been announced by Davey Compressor Co., Kent, O.

Suitable for mounting on any standard long wheel base truck, the shop assembly is stated to contain virtually every item of equipment needed for mechanical repair and maintenance work. While it is possible to secure almost any desired combination of equipment, the Davey Co. has worked out a number of standard assemblies for the use of specific



Davey Mobile Repair Shop

operators. For example, one assembly includes as its main units, a 60 cu. ft. Davey compressor, a 300 ampere Lincoln welding generator, 5 KW Westinghouse power generator, a 14-in. South Bend lathe (with complete lathe accessories and tools), and a drill press of 1-in. capacity. Auxiliary accessories are the same as those found in any stationary machine shop. Key to the entire assembly is the Davey split propeller power take-off. This device inserted in the drive shaft of the truck, transmits all of the power of the truck engine to the driving of the air compressor, welding generator and power generator.

•

New Hot Spray Bar

5. Many advanced features of design and construction are claimed for a new hot spray bar for distribution of bituminous materials, now available from The Cartwright Asphalt Equipment Co., North Robinson, O. The new bar is of double construction—the material entering the inner pipe which carries the material to the very ends of the bar, from which points it

Mail Inserted Card

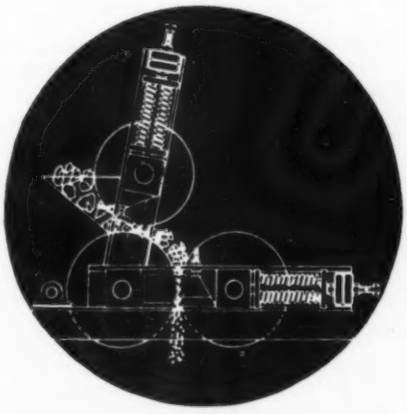
for data on equipment described on these pages

circulates back through the entire length of the outer pipe—and on out the spray nozzles or back into the supply tank. This circulation of material is under positive pressure at all times from a rotary positive pump. The valves are located right in the spray nozzles giving instantaneous "full-on" or "shut-off" control without drip. The bar can be attached to any distributor and is available in different lengths.

•

New Triple Roll Crusher

6. A new design of roll crusher employing three rolls has been announced by Pioneer Engineering Works, Minneapolis, Minn. The triple



Triple Roll Crusher

roll crusher has three rolls equipped with manganese steel shells. The extra roll is mounted over the stationary roll in such position that the rock is fed into the opening between the top roll and the stationary roll and then passes between the stationary roll and the horizontal floating roll. For those who have Pioneer roll crushers, the third roll assembly can be shipped from the factory complete with all attachments. The triple roll crusher is available at present in two sizes—54 in. x 24 in. and 40 in. x 22 in.

•

New Rubber Rivet for Tire Repairs

7. A blowout-proof rubber rivet which is stated to permanently seal small breaks and nail or spike holes

Rubber Rivet for Tire Repairs

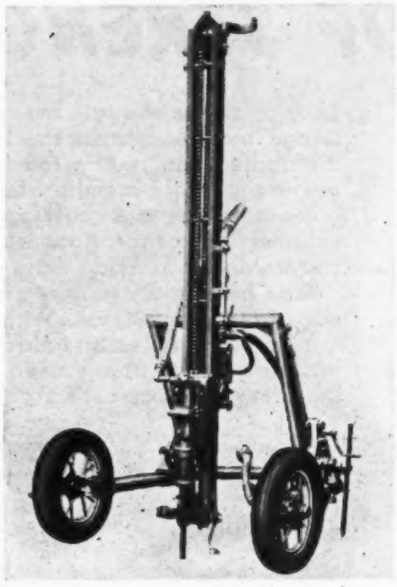
in truck, automobile and tractor tires, is a new product of J. W. Speaker Corporation, Milwaukee, Wis. It is stated that by "flowing" into every inside crevice and putting a rubber "head" outside the original injury, the blowout-proof rubber rivet prevents water and slush seepage, chief cause of fabric rot and eventual blowouts. The rubber rivet, made in three sizes, consists of a circular rubber base and a rubber stem with a spiraled steel needle that goes through openings as small as pin holes. The device can be installed in two or three minutes.

•

New Wagon Drill

8. A new model wagon drill, incorporating several radical design features, has been added to the Blue Brute line of the Worthington Pump and Machinery Co., Harrison, N. J.

The new model uses a heavy duty drifter, the cylinder of which has a diameter of 4 in. It has rifle bar rotation and Worthington positive acting end-seating valve with circumferential seal. The cylinder controlled blowing device is stated to give exceptional hole cleaning ability. Added features are: one piece chucksleeve, positive drill steel locking chuck for



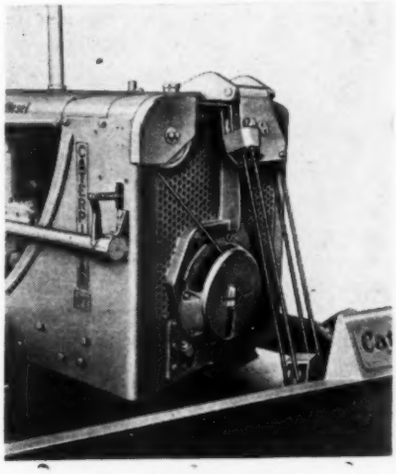
Model UMW-40 Wagon Drill

1¼-in. hollow round lug shank drill steel, one air hose to backhead with swivel to prevent fouling. Heat treated alloy steel is used in all major parts, and slow rotation parts are available. The drifter may be easily converted to wet drilling. The wagon mounting has a one-man lifting device which permits quick adjustment of the U-arm and drilling unit. The U-arm may be moved on the tubular frame for unusual drilling conditions, and the quick locking rear wheels may be turned through 90° for drilling vertical holes near a quarry face.

•

New Cable Control Unit

9. Production of a new single drum, front-mounted cable control has been announced by Caterpillar Tractor Co., Peoria, Ill. Features claimed for the new control include: Rapid, positive action because the controls respond quickly to give accurate, powerful



No. 24 Cable Control

control with a minimum of operating effort. The design permits rapid free spooling when desired. The famous "Caterpillar" multiple disc clutch with metallic facings provides easy, smooth clutch engagement for smooth operation. Synchronized brake release and clutch engagement, or clutch release and brake engagement, also add to smoother operation and greatly reduce wear and heating. A large size brake band assures ample braking power and prolongs lining life. The unit is readily accessible to the operator for adjustments, and the control lever is placed to insure a minimum of operator strain. All normal adjustments of clutch and brake mechanisms can be made quickly and easily from the outside of the unit. Easily removable covers permit ready access for inspection or replacement of internal parts.

•

Four New Blaw-Knox Products

Four new developments have been announced by the Blaw-Knox Co. of Pittsburgh, Pa. They include a widening finisher, a precision subgrader, a segregation eliminator, and a concrete paving conveyor.

The Precision Subgrader

10. The Blaw-Knox precision subgrader employs an entirely new principle of cutting the subgrade for pav-

ing construction to the exact elevation and shape required by the specifications. The precision subgrader is stated to leave the subgrade as firmly compacted as the original prepared grade, and thus eliminates the need for subsequent compacting of the subgrade by rolling. Flexibility of operation is one of the characteristics of the new machine. The Blaw-Knox Company will make it available in widths adjustable for half-width and full-width paving operations, very similar to the adjustable widths now obtainable in the Blaw-Knox paving spreader and the Blaw-Knox finishing machine.

•

The Widening Finisher

11. This machine, intended primarily for widening work on concrete paving construction, is simple and inexpensive to operate. It is of the single screed type and can accommodate widths from 2 to 6 ft. It has two traction speeds, forward and reverse, and there are two screed speeds to allow for concrete of different textures. The same machine can be used for building concrete sidewalks.

Widening Finisher

•

The Concrete Paving Conveyor

12. This unit is a portable conveyor for concrete paving construction which rides the forms ahead of the concrete paving spreader and finishing machine, receives the concrete from truck mixers, and deposits the concrete within the paving area. The paving conveyor works in the following manner. The conveyor receives the concrete in a collecting hopper which is cantilevered beyond the side form. There it is in a position to receive the discharge from truck mixers while they are parallel to the longitudinal axis of the paving operation. The concrete is conveyed laterally and deposited within the paving area. In half-width construction, the concrete is deposited in the center of the lane, while in full-width construction, the concrete is deposited at the two quarter points.

•

The Segregation Eliminator

13. This device was originally developed to prevent the tendency of coarse aggregates to segregate as they are discharged from overhead storage bins. The eliminator is simple and inexpensive, and can be installed in each of the coarse aggregate compartments of the overhead storage bin. It is adjustable in its operation and automatic in its func-

PLENTY OF STRENGTH

FOR THE *Biggest Loads*

Look at all the strength built into a Jahn trailer! Deep, wide flange, main beams run the full length. Loads are equally distributed and transferred to these main beams through numerous cross-member beams. Note particularly that cross-members and outriggers are I-beam sections, not channels. All connections where steel meets steel are electric welded to provide extra strength.

Jahn heavy duty trailers are offered in a wide range of sizes from 5 to 100 tons with any wheel or axle combination in semi-trailer or full-trailer models. Special trailers built to order to fit any need. Send for new catalogs just off the press. Mention capacity of trailer you want.

C. R. JAHN COMPANY

1345 W. 37th Place, Chicago 9, Ill.

"Come to Trailer Headquarters"

Ready to assist you on roadbuilding problems

PAVING BRICK INSTITUTE

MEMBER COMPANIES

Alton Brick Co.
St. Louis, Missouri

Ava Brick Company
Ava, Ohio

Collinwood Shale Brick Co.
Cleveland, Ohio

Hammond Fire Brick Co.
Huntington, West Va.

Hill Brick Co.
E. St. Louis, Ill.

Metropolitan Paving Brick Co.
Canton, Ohio

Stone Creek Brick Co.
Stone Creek, Ohio

Do you want technical and engineering data on new practices in the design and construction of roads and streets? Do you want more information about *brick*—most permanent and satisfactory roadbuilding material?

Get in touch with the Paving Brick Institute—newly formed, and affiliated with the internationally known Structural Clay Products Institute.

All of the member companies of the Institute, listed on the left, are ready to serve and assist you.

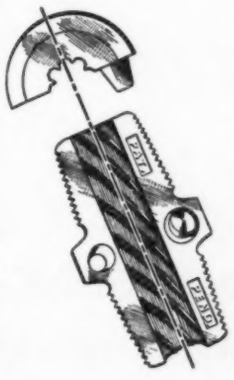
•

PAVING BRICK INSTITUTE
1756 K Street N. W., Washington 6, D. C.

•

SAFE-LINE
WIRE ROPE CLAMP
Never Slips

FASTER - SAFER - ELIMINATES SPLICING



FORGED AND MASTER COINED TO FIT ROPE
SIZES 1/16" TO 3/4"

Safe-Line double spiral splines fit each wire and strand, providing a *never slip* grip, without cutting action to the rope. Replacement guarantee on clamp against breakage and fracture.

Millions in daily use prove *Safe-Line* the right way to hold wire rope securely. It's the better way, too!

Better because *Safe-Lines* are faster than splicing and serving, or using U-bolts.

Better because *Safe-Lines* outpull the strongest rope, hold a tight thimble, minimize rope or sling breakage.

Better because *Safe-Lines* are easy to use and re-adjust, without special tools or skilled labor.

Better too, because *Safe-Lines* enclose sharp wire ends, preventing personal injury and mental hazards.

Try this better way that saves you time and money.

APPROVED BY UNDERWRITERS' LABORATORIES AND CIVIL AERONAUTICS ADMINISTRATION

WRITE FOR DESCRIPTIVE PRICE-LIST FOLDER

NATIONAL PRODUCTION COMPANY
4571 ST. JEAN AVENUE • DETROIT 13, MICHIGAN

tioning. Coarse aggregates, such as gravel, slag, and crushed stone, undergo segregation as they are deposited in overhead storage bins from clamshell buckets, conveyors, screens, and the like. The segregation eliminator corrects whatever segregation takes place while the bins are being filled, and delivers a uniformly graded aggregate from the discharge gate at the bottom of the bin compartment. The multiple compartment storage bins for central mixing plants, truck mixer loading plants and batching plants for road or bridge work made by Blaw-Knox will include provisions for the installations of the segregation eliminator in the coarse aggregate compartments of the storage bin, when required or specified.

•

New Travel Plant

14. A new travel plant, claimed to embody many advantages and improvements, has been announced by Hetherington & Berner, Inc., Indianapolis, Ind. The new plant is a completely self contained continuous mix machine approximately 8 ft. wide and 22 ft. long, mounted on pneumatic tires and driven by two gasoline engines. One engine is for driving the mixer and related units, the other for moving the machine along the road. Capacity of the plant is stated to be 100 to 120 tons per hour of any low cost or medium type bituminous mix. Paving speed can be regulated as desired between 4 to 50 ft. per minute. By shifting gears in one transmission

The Moto-Paver

the machine will travel under its own power 15 to 18 miles per hour, so that no trailer is necessary to haul it from one job to another. An integral unit of the plant is a novel spreading and laying device consisting of a patented spreading mechanism and a strike-off bar provided with leveling skids. Two 500 gal. bitumen tanks are mounted on the plant as an integral part. The mixer and asphalt pump are jacketed, and provision is made for the heating of both of these units, as well as the bitumen tanks. A special feeder is provided, so that a very accurate adjustment of aggregate flow into the mixer is available, and the asphalt pump is driven through an infinitely variable reducer which enables the operator to keep close control over the amount of binder introduced into the mix. The Moto-paver may be used either as a traveling plant, with the aggregate dumped directly from trucks into the plant on the road, or, with the special loader unit, windrowed material can be picked up off the road. The machine will use any available local material.

•

Solderless Wiring Kit

15. A complete wiring repair kit is now available for making quick, vibration-resistant electrical connections without solder. Produced in large quantities for the armed forces by Aircraft-Marine Products, Inc., the kit contains an all-purpose, precision installation tool which cuts, and strips the wire and attaches the AMP terminals to the wire. Also included is an assortment of 100 pure copper AMP terminals in a variety of the most commonly used types. No soldering or other equipment is needed to make electrical connections. Merely insert stripped wire in terminal bar-

Again Available! for—
IMMEDIATE DELIVERY
Two Servicised: Pre-War Products

1. Premolded—CORK EXPANSION JOINTS
2. Self-Expanding—CORK EXPANSION JOINTS

Servicised has for years furnished CORK EXPANSION JOINTS to Tenn.-Valley Authority (T.V.A.) on such projects as the Hiwassee Dam shown above —tallest of the T.V.A. structures.

SERVICISED: PREMOLDED CORK EXPANSION JOINTS are especially designed for work where a resilient, non-extruding type of expansion joint is required. Recommended for use in dams, reservoirs, highways, bridges or swimming pools. Will return to original thickness after compression—thus insuring against open joints.

SERVICISED: SELF-EXPANDING CORK EXPANSION JOINTS are for concrete slabs or structures which are apt to contract before expansion; but are made safe from infiltration as this type of joint will expand to approximately 140% of original thickness after compression. This joint is particularly suited for use in flood walls, dams, bridges, or wherever a possibility exists that initial contraction will exceed the original set.

Millions of dollars of public funds have been spent on expansion joints of all sorts, and it is common knowledge that in numerous instances, it has been discovered that the wrong type had been chosen with dire results.

The wide variety in the classification of joints makes it important that exactly the right joint be selected in every instance. There is no better guaranty of safety for your investment, as well as assurance of getting exactly the right joint, than to permit our Engineering Department to offer recommendations on the basis of experience gained in this field during the past quarter of a century.

MAIL COUPON TODAY FOR FURTHER DETAILS

SERVICISED PRODUCTS CORP.
6051 WEST 65th STREET, CHICAGO 38, ILL.
Name .....
Street .....
City ..... State 1-RS

rel and crimp with tool. No skill required.

•

New Crane

16. A rubber mounted two motor crane designed to permit immediate transfer of traveling and steering functions from Chauffeur's cab to crane operator's cab has been added to the line of Browning Crane & Shovel Co., Cleveland, O.

This "Tu-Control" crane is operated from the chauffeur's cab at truck speed when traveling overland or through congested areas. Upon arrival at the job, where the crane operator requires full control over his machine, the truck functions are taken over by him through the "Tu-Control" mechanism. Hand and other signals are not necessary. On the job the truck is moved forward, back, and turned by the crane operator. Truck engine is shut off. Precise control over the truck in relation to load on the boom is assured. Where needed, the travel and steer controls can be transferred back to the chauffeur's cab almost instantly.

Tu-Control Crane

•

New Truck Mixer

17. A new truck mixer equipped with sealed top-loading drum has been announced by the Jaeger Machine Co., Columbus, O. The drum, sealed by quick-opening and closing discharge door, is stated to retain heat in winter and to protect the concrete from bad weather at all times. In combination with use of the "slow" drum speed provided by Jaeger's exclusive 2-speed transmission, it also maintains the pre-determined slump of the material on long-haul deliveries. Lighter weight, lower center of gravity and ease of cleaning and maintenance are further advantages claimed for the top-loading type. Jaeger also offers end-loading units with the exclusive feature of a gated hopper which remains sealed to the drum at

JACKSON

ELECTRIC VIBRATORY HAND SCREED

Brand New and What a Honey!

The new JACKSON revises all previous ideas of what constitutes a thoroughly convenient, highly efficient hand screed. There is nothing in screed history that begins to approach it. Listen to this:

ONE MAN OPERATES IT WITH EASE

The position in which the vibratory motor is mounted tends to make the entire screed ***self-propelled!***

SECOND PASSES — *Easily, Quickly Made*

by simply lifting the handle and rolling the machine back as far as necessary. No other screed has this feature.

GETS RIGHT UP TO THE WALLS

Nothing protrudes beyond the end of the screed. Hence it may be operated practically ***against the wall.*** With no other screed, to our knowledge, can you do that.

VARIABLE FREQUENCY CONTROL TO SUIT CONSISTENCY OF ANY MIX

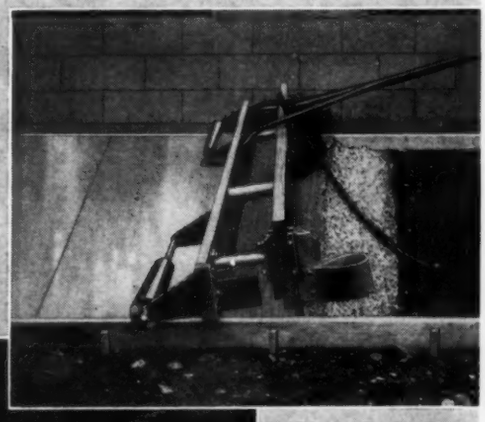
by instant adjustment of power plant engine throttle. Thus plenty of energy may be had for thoroughly puddling stiffest mixes throughout the section; vibrations reduced for second passes.

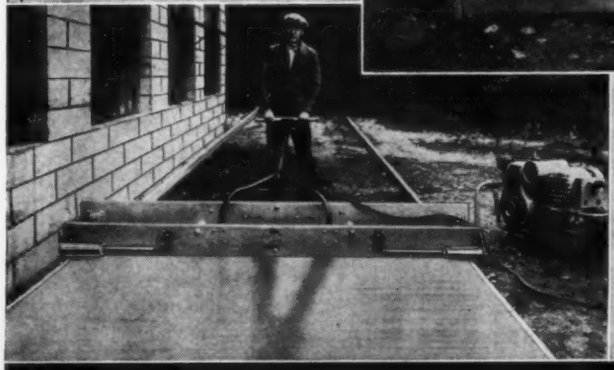
INSTANTLY ADJUSTABLE ROLLERS

to vary screed length over 4 ft. range. Screed planks quickly renewed. Available in any practical length.

A NEW HIGH IN DEPENDABLE PORTABLE POWER

Is now available in the JACKSON postwar Power Plants. These have permanent magnet generators in which all usual maintenance, other than lubrication, is eliminated. Especially designed for severest service under continuous operating conditions. Simple, rugged construction and design, stripped of fussy control gadgets. Operate all Jackson Vibrators. Ideal for lights, and all types of contractors' power tools. 1 to 7.5 KVA sizes available. Get the facts on this time and money saving equipment! Write, NOW.





Above—Tilted to make a second pass.

Left — Forward movement requires little more than guidance on part of operator.

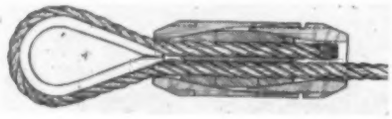
ELECTRIC TAMPER & EQUIPMENT CO. LUDINGTON MICHIGAN

all times, permitting use of light-pressure rubber seal with built-in pressure lubrication. Both top and end-loading types offer such important post war improvements as water tank mounted low on the main frame, high pressure water pump and positively clog-proof water jet, positively aligned transmission and center drive to internal drum gear, and enclosed front end providing weather protection and winter warmth for engine, transmission, water system and drum.

•

New Wire Rope Clamp

18. A new wire rope clamp, stated to incorporate a new and exclusive wedging action in its component parts, has been developed by Nunn Manufacturing Co., Evanston, Ill. The unit is alloy steel, cadmium plated for



Cabl-Ox Clamp

weather protection, streamlined for neat appearance and freedom from obstruction. It is easily assembled by unskilled labor and may be readily disassembled for the tightening of stretched lines or other uses. It is made in all standard sizes from 1/16-in. to ¾-in.

•

New Portable Crushing Plant

19. A new portable crushing plant—The Cedarapids Junior Tandem Straightline Plant—has been added to the line of Iowa Manufacturing Co., Cedar Rapids, Ia. One of the most outstanding features claimed for the new Junior Tandem is its flexibility.

Junior Tandem Plant

By itself, the plant is a complete gravel plant that's big enough to turn out large quantities of crushed gravel that will meet the strictest specifications. By putting a portable primary ahead of it, the Junior Tandem becomes a complete quarry plant. The addition of a multi-bin unit with sizing screen makes a complete multi-sizing gravel or stone crushing plant. Sprays, washing screens and sand tank then can be used to form a complete crushing, screening and washing plant that will produce aggregate for all the various types of construction jobs. The Junior Tandem is made up of high capacity, standard, Cedarapids units with matched capacities so material flows in a steady stream from the feeder, through the plant and into the trucks or bins. A 10-in. x 24-in. roller bearing jaw crusher, 24 in. x 16-in. roller bearing roll crusher, 2 or 2½-deck, 36-in. x 10-ft. horizontal vibrating screen, with the necessary conveyors, feeder and return wheel, are all operated by a single power unit through V-belts and universal drives. The entire plant is mounted on pneumatic tires.

•

New Unit for Street Lighting Control

20. Early large scale production of a new electronic "sun switch," designed to control street lighting to insure the required illumination regardless of fluctuations in weather conditions and the twilight hour, has been announced by The Ripley Co., Torrington, Conn. The new unit will be priced low enough to permit installations on each light. A minimum safety factor is in-

Welded for Strength & Service

WELLMAN

Williams **BUCKETS**

Welded Rolled Steel construction builds longer life and greater utility into Wellman buckets. Multiple Rope and Power Arm types. Dragline. Power Wheel. Special Service Buckets. ⅜ to 16½ yd. capacity.

Send for Bulletin

THE WELLMAN ENGINEERING CO.
7003 Central Avenue • Cleveland 4, Ohio
Sales and Service Agencies in Principal Cities

corporated in all components, principal of which are standard amplifier tubes, a photo-electric cell and relay. These factors, coupled with special tungsten alloy contacts on the relay

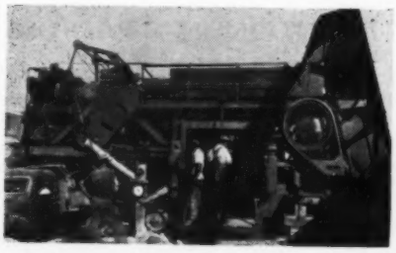
Sun Switch

(the only moving parts), are stated to insure unfailing dependability and efficiency. Under ideal conditions of daylight the control provides a minimum "lights on" period from 25 minutes after sunset to 25 minutes before sunrise and adjustment is provided to meet customers' specific requirements.

•

Two New Portable Asphalt Plants

21. Two entirely new portable asphalt mixing plants have been announced by Iowa Manufacturing Co., Cedar Rapids, Ia.



Model F. Portable Plant

The Model "F" is a portable, 2,000-lb., batch-type plant which contains many new features that increase its portability and at the same time sim-

Yes, many contractors have done just that with KOTAL Master Mixes. An Indiana city engineer confessed he was amazed at the results when his contractor, working long before the normal time for spring repairs, merely swept the snow and water from the potholes and laid the KOTAL Mix right on the cold stone base.

And, that's not all! After slight tamping, traffic rolled over the repaired roads and found a remarkably firm, stable surface, practically the equal of any asphalt laid under ideal summer conditions.

Six Years of Use

have demonstrated the value of KOTAL Master Mixes as all-weather, easy-to-use mixes that help the contractor achieve tough, long-wearing roads.

Low Cost Application

KOTAL Master Mixes do not require skilled help to lay. Savings are shown on both time and labor costs.

The contractor who is looking ahead to those early spring repairs will find NOW a good time to study the benefits of KOTAL Master Mixes:

Eight Working Features of KOTAL Master Mixes

EASY TO USE. Quickly mixed, ready to lay. No preheating or drying.
STABILITY. Cure quickly and permanently. Do not shift, ravel or pick up. Open sooner to traffic.
WORKABILITY. Do not adhere to equipment. Work easily.
LONG-TERM STOCK PILES. Can be stock-piled for many months without losing workability.
SAVE TIME. Quickly made stock piles ready for immediate use without frequent fresh mixes.
SAVE LABOR. Actual road records prove fewer labor hours required.
SAVE MONEY. Savings in time and labor mean economies in road costs.
EXTEND PAVING SEASON. All-weather workability permits more months of operation.

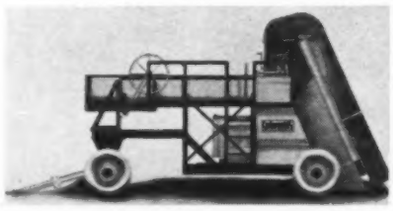
Write for your copy of booklet which tells the story of KOTAL Master Mixes. We will also send you the name of your nearest supplier.

MASTER MIXES KOTAL **KOTAL COMPANY ★ 52 Vanderbilt Ave. ★ New York 17**

KOTAL *Master Mixes*
The Advanced All-Weather Aid in Building Better Roads

plify its operation. It can be set up for operation in minimum time because the only part that has to be raised is the elevator which is of the telescoping type. Aggregate is dumped into a hopper and elevated to a 36-in. x 10-ft. triple deck, horizontal vibrating screen where it is accurately graded and put into a 4-compartment (6 batch) aggregate hopper. Material passes into 25 cu. ft. batcher, correctly proportioned to meet the most exacting specifications. A patented skip carries the material up to the 25 cu. ft. pug mill where it is thoroughly mixed and dumped directly into trucks for delivery to the job. The operator's platform is on the ground level with all the controls centralized so he has complete control of all operations. The Model "F" is mounted on pneumatic tires for trailer or semitrailer hookup and can be used for hot or cold mixes with or without a drier.

22. The Patchmaster is a rugged low-cost, continuous-mix type plant that will turn out a remarkably accurate mix at the rate of 25 to 30 tons per hour. This new plant provides the same accurate, easy control, continuous, uniform mix and high capacity as the larger Cedarapids plants and is particularly useful where relatively small quantities of mixes are needed from time to time. It can be started up without delay and without incurring the expense



Patchmaker Portable Plant

usually involved in large units. All controls for fast, easy adjustment of mixing are within easy reach of the operator on the charging platform. Single shaft, 16-in. x 10-ft. pug mill insure thorough, unvarying mixes. Fully enclosed, chain type bucket elevator, 2-in. positive discharge, rotary type asphalt pump and apron type feeder are synchronized with the pug mill to provide fast adjustment to meet exact specifications. It is available with or without running gear or drier so it can be used as a portable or stationary type plant.

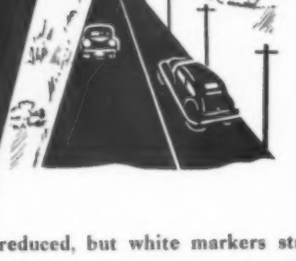
All Metal Welding Hammers

23. All metal ball-pein hammers have been brought out by Atlas Welding Accessories Co., Detroit, Mich. The all-steel handle is stated to be unbreakable; it will never come loose

All Metal Ball-pein Hammers

from the hammer head, for there are no wedges to come out. The heads are of finest alloy steel, flame hardened for toughness.

cut down road glare
reduce hazards



Concrete pavement is safer, easier to drive on when Emulsified Black is used to produce soft tones of grey or black. Not only is glare greatly reduced, but white markers stand out more strongly, reducing traffic hazards. Emulsified Black also hides unsightly oil stains.

Emulsified Black complies with State specifications. A colloidal dispersion of not less than 25% carbon black, it flows freely, working immediately into the mix. Emulsified Black requires no pre-mixing, and is easy and clean to handle. *For further information write to*

CARBON DISPERSIONS, INC.
27 HAYNES AVE., NEWARK 5, N. J.
TEL. BIGELOW 3-4511

BLACK SHIELD C-D

LINCOLN ARMOR-EDGE BLADES

LINCOLN Armor-Edge BLADES

FOR EVERY USE!

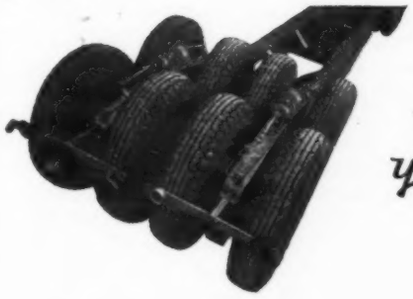
FOR GRADERS — SCRAPERS — DRAGS
SNOW PLOWS—MAINTAINERS—PATROLS

Special Tough Steel Rolled to Shape NOT REHEATED!

NOW AVAILABLE for immediate delivery—LINCOLN ARMOR EDGE BLADES, guaranteed for long, heavy service. All types—curved or flat, single bevel or double bevel. Made in our Lincoln plant of special high-grade steel for tough, heavy duty. Blades curved and beveled when made—never reheated. PUNCHED HOLES, positively guaranteed to fit accurately. Each blade rigidly inspected throughout entire manufacturing process. Write today for complete specifications and prices.

LINCOLN STEEL WORKS
LINCOLN NEBRASKA

ROGERS GIRDER TYPE



the BETTER trailer for your BIGGER hauling jobs

THIS trailer, designed by Rogers Brothers to meet low headroom conditions, has been used for some time in certain sections of the country. Now, because of the larger equipment in use, it is coming into extensive use elsewhere.

ROGERS BROS. CORPORATION

110 Orchard St. **Albion, Pa.**

MANUFACTURERS' LITERATURE

Conveyor Belts

24. A new "Guide to the Selection of Conveyor Belt Grades" has been issued by The B. F. Goodrich Co., Akron, O. It discusses differences in various grades; outlines the reliable measurements of qualities in various type belts and the services for which they are commonly applied. Description and data, as well as the ordinary uses for each of its conveyor belt grades, together with those for special constructions are also given.

•

Hose Fittings

25. A new catalog section on its lines of hose fittings, including couplings, joints, clamps, washers, nozzles, nipples and flanges has been published by The B. F. Goodrich Co., Akron, O. Featured are instructions for properly attaching couplings, and other types of fittings which add to service life and make the hose safer.

Power Shovel, Crane

26. A complete, detailed description of the new Koehring 605 excavator (1½-yd. shovel, 30-ton crane) is contained in the new 605 catalog just published by Koehring Co., Milwaukee, Wis. Sixty-five photographs illustrate every important operating advantage of the Koehring 605 excavator, including the shovel boomfoot shock absorber, new improved shipper shaft design, trigger-fast ratchet dipper trip, pin-mounted dragline fairlead and the collapsible high A-frame which is raised and lowered by power. Other features which are completely described are the hardened cast alloy shoes, a new power clutch which retains the "feel' of the load, adjustable hook rollers, one-piece turntable, straight splined shafting and movable engine mounting.

•

Pavement Slab Pumping

27. Detection and prevention of pavement slab pumping is fully discussed in a 20-page booklet just published by the Koehring Co., Milwaukee. The booklet describes and with numerous pictures effectively illustrates the early stages of slab pumping and goes on to outline the preventive mud-jack treatment adopted by many states and municipalities to combat pavement slab pumping in its early stages.

•

Trailer

28. The new PD-10 rubber-tired trailer of Athey Products Corporation, Chicago, Ill., is described in a recently issued broadside. It tells the complete story of the new trailer, and is illustrated with photographs, and diagrams . . . shows design features, applications and specifications.

•

Tournacrane

29. A folder describing various uses of the Tournacrane has been issued by R. G. Le Tourneau, Inc., Peoria, Ill. It presents on-the-job photographs of various Tournacrane applications. In addition, a handy chart showing Tournacrane lifting capacities at various reaches is included. Also described are Tournacranes specially built for Army-Navy use, as well as Tournapull interchangeability with Carryall scrapers, Tournatrucks, and Tournatrailers.

THE OWEN BUCKET CO.
6070 Breakwater Avenue Cleveland, Ohio
Branches: New York, Chicago, Philadelphia, Berkeley, Cal.

Light Weight Pipe

30. A new 56-page catalog featuring applications of light-weight pipe in diameters from 4 to 30 in. has been issued by the Naylor Pipe Co., Chicago. Illustrated throughout this book are installations showing the application of Naylor lockseam spiralweld pipe in many fields. Along with valuable data on pipe structure are sections on precision fabrication and pipe connections including an entirely new type of coupling which saves time and labor for users.

•

Highway Booklet

31. "Fundamentals of Highway Engineering and Construction" is the title of a 40 page booket published by the Tractor Division of Allis-Chalmers. Described in the terms of the layman, the book is a condensed account of the more important phases and terms of Highway Engineering.

Written by O. C. Rollman, a former Construction Engineer with the Wisconsin State Highway Department and Consulting Civil Engineer, the booklet first gives a brief summary of the contract system. Then the Survey, Plan and Construction of a Highway Project, which includes a reproduction in small scale of a Standard road plan with other pertaining graphs and data. The pamphlet then goes on to summarize the more general construction definitions and terms. The subjects of Construction Specifications and Soil Engineering are also topics discussed, with the last two pages being devoted to (1) a Conversion table (Lineal Feet to Miles) and (2) a Weights and Thickness table (Various Pipe used for Highway Drainage). A limited quantity of these booklets is available. For your copy, write Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee 1, Wis.

•

Concrete Mixers

32. The new streamlined Rex 6S mixer, the Rex 3½S end discharge tilter, and the Rex Skipper are pictured and described in Bulletin No. 480 just published by Chain Belt Company of Milwaukee. Many new machine innovations are emphasized by means of small sketches, and there are large illustrations which show the main mechanical features. Two pages are devoted to a composite set of specifications on the three mixers.

•

Shovels—Cranes—Draglines

33. A new 24-page catalog covering their line of 1½ to 2 cu. yd. capacity shovels-cranes-draglines has been published by Link-Belt Speeder Corporation, Chicago. Illustrated are many interesting examples of the Link-Belt Speeder Series "300" machines, applied to a wide variety of excavating, steel erecting and material handling jobs. The catalog also covers many advanced engineering features of the series "300" machines.

•

Concrete Paving Spreader

34. Twelve exclusive features of the latest Blaw-Knox concrete paving spreader are described in detail in a booklet issued by Blaw-Knox Co., Pittsburgh, Pa. This spreader moves the concrete longitudinally and transversely at the same time. A feature of the spreader is the automatic transverse blade, which distributes the concrete uniformly, regardless of where it is placed on the subgrade.

•

Welding Rods

35. A 16-page booklet "Edco Electrodes" has been issued by Eccles & Davies Machinery Co., Inc., Los Angeles, Calif. It describes in detail the physical and chemical properties of these phosphor bronze electric welding rods. It gives uses and techniques for welding copper, bronze, cast iron, steel and their alloys; and contains a polarity table and directions for best welding results.

FOR MIXED-IN-PLACE ROAD CONSTRUCTION

ARIENS AGGMIXER

HERE'S that equipment you will need for secondary roads. Arions Aggmixer is designed especially for mixed-in-place road construction, operating in connection with other general purpose equipment, for use wherever aggregates are used, such as all types of bitumens, clays, cements, chlorides, etc. These materials are mixed without being displaced on the road surface, being thoroughly pulverized, mixed and aerated regardless of the binder used. The Aggmixer does the job thoroughly, rapidly, and economically. It is safe and easy to operate . . . adjustable to any tractor. Made in 4 sizes with normal cutting widths 4', 5', 6', and 7'.

Write for complete job facts and name of nearest distributor.

ARIENS COMPANY BRILLION WISCONSIN

For Garbage Disposal or Snow Removal

Brooks LOAD LUGGER

is one of the most important items of equipment to include in your 1946 budget. Fits on any truck . . . made with various types of buckets . . . for scores of uses in municipal, county and federal work. *Write for Bulletin.*

501 Davenport Road, Knoxville 8, Tenn.
Distributors in All Principal Cities

Brooks EQUIPMENT & MFG. CO. KNOXVILLE TENNESSEE

WITH THE MANUFACTURERS & DISTRIBUTORS

Adams Joins Worthington

Floyd S. Adams of Ada, Okla., has been added to the sales staff of Worthington Pump and Machinery Corporation's Construction Equipment Division. He will cover Texas and Oklahoma, handling the Blue Brute Line of portable air compressors, air tools, concrete pavers and mixers for Worthington under Harry J. Schultz, Manager of the Central Region, Chicago.

F. S. Adams

Adams is an old timer in the field of construction equipment and is already well acquainted in his assigned territory, having handled various manufacturers' lines before. He was recently relieved of his responsibility in a Texas war industry, after devoting three years to this work.

McKenrick Appointed Manager

R. P. (Bob) McKenrick has been appointed manager of construction equipment of the Blaw-Knox Division of the Blaw-Knox Co., Pittsburgh, Penn. He has for ten years been in charge of construction equipment sales in the midwestern states comprising the Chicago territory. Mr. McKenrick has a background of actual construction experience, gained during his seven years with the Pennsylvania Highway Department. During the war he was project manager in charge of construction of the huge synthetic rubber plant built by the Blaw-Knox Co. for the B. F. Goodrich Co., Louisville, Ky.

Stutson Promoted by Socony

Alvord C. Stutson, heretofore assistant chief engineer, has been appointed chief engineer technical division-industrial section of Socony-Vacuum Oil Co., Inc., succeeding W. G. G. Godron, who has retired. Gerald J. Van Liew, staff engineer, has assumed the position of assistant chief engineer.

Available for
INTERNATIONAL Models I-4 and I-6
ALLIS-CHALMERS "WC" with wide front wheels
OLIVER "70" Industrial
MINNEAPOLIS-MOLINE "RTI" and "UTI"

Lifts 3,000 Pound Load 8 Feet

The "Ottawa" INDUSTRIAL Hydraulic Front-End LOADER is a HEAVY DUTY Machine . . . it lifts 3000 pounds of Sand, Gravel, Rock, Coal, Steel Pipe, Dirt or Other Bulk Materials to a height of 8 feet quickly and easily . . . it assures operator perfectly CLEAR VISION at all times, is quickly and simply ATTACHED or DETACHED and is SHIPPED COMPLETE (there's absolutely nothing additional to buy or add) with complete HYDRAULIC SYSTEM including pump and valve. Bulldozer blade, Snowplow and Boom attachments are available. Write or wire today for FREE ILLUSTRATED FOLDER and prices. Immediate shipment.

Ottawa STEEL PRODUCTS, Inc.
OTTAWA 20, KANSAS

Scrapers and Cableways
for Dig-and-Haul Jobs

Explanation of Picture—Here is a Sauerman Power Scraper of heavy duty type stripping muskeg overburden to uncover a gravel deposit in Alaska. After completing the stripping, this scraper kept right at work hauling the gravel to a portable crushing plant. Sauerman Scrapers are making money for thousands of owners who use this equipment for all kinds of long range material-handling jobs.

With a Sauerman Scraper or Cableway you can make easy work of many material handling projects that would be difficult and costly by any other method.

Digging, hauling and automatic dumping are merged into one operation controlled by one operator. Power requirement is moderate. Maintenance is simple.

Standard Sauerman machines offer handling capacities from 10 to 600 cu. yd. per hour and operating spans from 200 to 1000 ft. Larger units are built to order.

Specifications of the various sizes and types of machines, with illustrations of their use, are given in the Sauerman catalog. Write for this literature today.

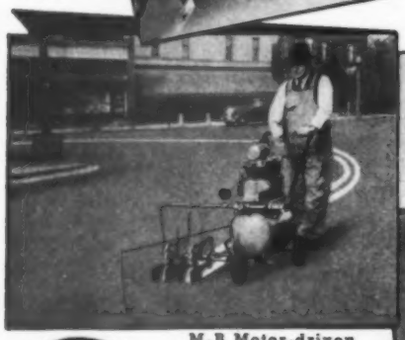
SAUERMAN BROS., Inc.
588 S. CLINTON ST., CHICAGO 7, ILLINOIS

SAFETY on the Home Front

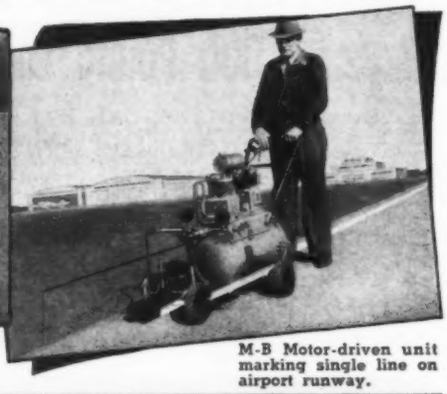
M-B Motorless Marker striping factory aisle.

Reduce accidents to a minimum, both indoors and outdoors, by systematically striping designated traffic lanes. M-B MARKERS simplify the job. They handle ANY type of striping job — factory aisles, street centerlines, crosswalks, etc. Also handy for marking airports, athletic fields, tennis courts, playgrounds, etc. Quickly convertible to all-purpose paint sprayer for painting park benches, guard rails, traffic signs and other municipal equipment. Two types — motor-driven for all-purpose painting and motorless for striping only. Write for literature.

Meili-Blumberg Corp., Dept. RS-1, New Holstein, Wis.



M-B Motor-driven Marker putting down double line at street intersection.



M-B Motor-driven unit marking single line on airport runway.

MB MARKERS

A 4365-⅓

You'll wonder how you got along without this unique

DATA BOOK FOR CIVIL ENGINEERS

DESIGN

By ELWYN E. SEELYE
Consulting Engineer

Nowhere else in one volume today will you find all the design data that are concentrated in this book. Over 400 pages of plates cover the main fields of civil engineering—structures, sanitation, water supply, drainage, roads, airfields, dams, docks, bridges and soils. All information is graphically presented, so that diagrams, charts, illustrations, and numerous time- and labor-saving tables cover each point clearly and completely.

DATA BOOK—DESIGN will expand the field of activity of the experienced engineer. Inexperienced engineers will find that this book will help eliminate costly mistakes.

(1945) 417 Pages $7.50

ON APPROVAL COUPON

John Wiley & Sons, Inc.
440 Fourth Ave.
New York 16, N. Y.

Please send me a copy of Seelye's DESIGN on ten days' approval. At the end of that time, if I decide to keep the book, I will remit $7.50 plus postage; otherwise I will return the book postpaid.

Name .....
Address .....
City and State .....
Employed by ..... R&S-1-46

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO.

Phillips Promoted

Thomas C. Phillips has been appointed an assistant general manager of sales of Pittsburgh Steel Co. His duties will be concerned chiefly with sales of the company's Monessen-Works steel and wire products. Mr. Phillips, except for a few years with Johns-Manville handling certain Pittsburgh Steel Co. products, has been associated with Pittsburgh Steel Co. in production and sales capacities for the past 30 years, and since 1941 was dealer sales manager of construction products.

Powell Returns to "Caterpillar"

Commander Burt Powell, former news editor of Caterpillar Tractor Co., has returned to the Company as a member of the sales department following 4½ years of service in the U. S. Navy. A veteran of the first world war, Commander Powell entered World War II as a lieutenant in March 1941 and saw action while aboard the escort carrier U.S.S. Coral Sea in the Pacific. Following his return to the States after an injury at sea he became Aide to the Commodore at Great Lakes Naval Training Center. He has been associated with "Caterpillar" since 1935.

B. Powell

Allis-Chalmers Appointment

Charles N. Karr has been appointed sales promotion manager, Tractor Division, Allis-Chalmers Manufacturing Company, succeeding E. L. Aikens, recently placed in charge of the company's Tractor Division, Seattle, Wash., office. Mr. Karr is a veteran of the Allis-Chalmers Tractor Division organization, having completed his first sale of an Allis-Chalmers tractor in 1919. Later he opened the first Allis-Chalmers tractor in Illinois at Bloomington. He moved to Peoria as Branch Manager in 1931 when Allis-Chalmers purchased the Rumely Co.

C. N. Karr

New M-R-S Service Manager

Conger H. Jones has been appointed service manager of M-R-S Manufacturing Co., Jackson, Miss. Mr. Jones is a former captain of field artillery in the U. S. Army, having recently received his discharge after five years of military service including 25 months in the Mediterranean and European theatres. Before entering the Army, he was connected with the service department of the General Electric Supply Corporation, Memphis, Tennessee. He will work in cooperation with distributors of the company's Mississippi Wagons.

C. H. Jones

DuPont Division Heads Retire

The retirement Jan. 1 of the heads of two divisions of the Du Pont Explosives Department has been announced. They are C. A. Woodbury, manager of the Technical Division, and I. J. Cox, manager of the American Glycerin Section and production manager of the Black Powder Section. Mr. Woodbury will be succeeded by Dr. B. H. Mackey. The duties of Mr. Cox in the American Glycerin Section will be taken over by G. H. Loving, an assistant director of sales of the Explosives Department, and those in the Black Powder Section will be taken over by H. K. Babbitt, production manager of the Special Products Section.

Changes Name

The name of Furnival-Rimmer Co., distributors, Lancaster Ave. at 34th St., Philadelphia, Pa., has been changed to Furnival Machinery Co. A branch office has been opened at North Cameron and Forster Sts., Harrisburg, Pa., in charge of Allen C. Fitterolf, manager.

Shepherd Joins Gibson-Stewart Co.

Dwight W. Shepherd has been appointed sales representative in the Columbus, O., territory of the Gibson-Stewart Co., contractors equipment distributors. He will be located at the Columbus headquarters of the Gibson-Stewart Co., 146 South Yale Ave.

New Managing Director

George H. Kimber has been appointed to the newly created position of Managing Director, according to an announcement from the Calcium Chloride Association office in Detroit. He assumed his new duties Jan. 1. Mr. Kimber has been affiliated with Solvay Sales Corporation for the past 25 years, and as Manager of Calcium Chloride Sales, acquired broad experience in the many technical uses of the chemical. For the past 11 years, Mr. Kimber was Chairman of the executive committee of the association and became thoroughly familiar with the program of extended independent research carried on at the National Bureau of Standards and various universities as well as at governmental and private laboratories. He also kept in close touch with the Association's publication and distribution of considerable technical literature giving the results of the research and practical field use.

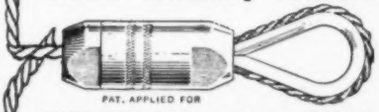
G. H. Kimber

LOOK INTO...

Cabl-ox

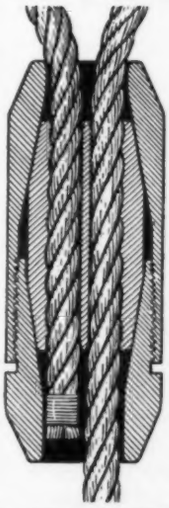
THE NEW WIRE ROPE CLAMP

That Really Holds the Line!



PAT. APPLIED FOR

CABL-OX clamps work on a brand new wedging principle. Holding power increases with the load and exceeds tensile strength of rope used. Does not crush and weaken rope like old style U-clips. Assembly is fast, neat . . . saves breakdowns, equipment, injuries and expense. Can be used over and over. Cadmium plated.



Cabl-ox

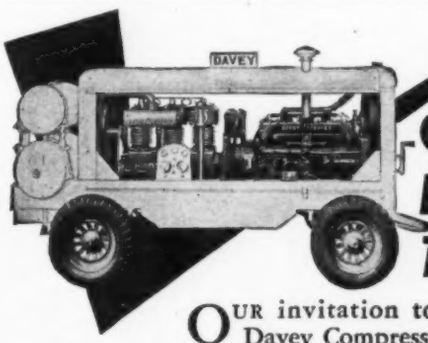
Made in all sizes from 1/16" to 3/4". For all wire rope applications.

• FASTER • SURER • SAFER
• STRONGER • ECONOMICAL

Ask your distributor or write for illustrated folder and prices.

NUNN MANUFACTURING COMPANY

2125 Dewey Avenue, Evanston, Illinois



CHECK IT BY ANY TEST - -

OUR invitation to subject the Davey Compressor to the acid test of comparison is backed by the fact that it will deliver its rated output over a longer period of time than any other compressor, that its long-run cost is less.

Davey guaranteed-for-life valves provide just one of the many reasons for this superiority of Davey Compressors. Davey conservative-speed operation is another big factor adding to its long, trouble-free service. Add other Davey engineering features such as welded steel frame, aluminum alloy cylinder heads and automotive type steering and you can see why we invite product comparison.

Write For Catalog E-172 for full information on the complete line of Davey Compressors, Heavy-Duty Truck Power Take-Offs and Pneumatic Saws.

D-945-20

DAVEY Compressor Co.

KENT • OHIO

DEALERS IN PRINCIPAL CITIES

A TOUGH ROLLER FOR TOUGH JOBS

PIERCE-BEAR 3½ - 5 TONS, VARIABLE WEIGHTS

Engineered for economical operation where the going is tough. Compact, easy to operate. Rear roller gives heavy duty compression. Built-in water tanks for wet rolling. Powered with Allis-Chalmers Industrial Heavy Duty Model "B" gasoline engine. Write for details.

Manufactured by

H. W. LEWIS EQUIPMENT COMPANY

415-431 Hoefgen Ave. SAN ANTONIO 6, TEXAS

Phone Garfield 6137 Phone Garfield 8931

New Timken Division Manager

Fred Reiser, Jr., Cincinnati District Manager for the Industrial Division of the Timken Roller Bearing Co. since 1944, has been named Division Manager for all divisions of the company there, including Industrial, Steel, Automotive, and Service-Sales. Employed by the company Aug. 11, 1933, in the Industrial Engineering Department, Reiser was sent to Pittsburgh March 15, 1935, as a sales engineer. He was transferred to Cincinnati June 16, 1941.

Schmidt Named Manager

Carl G. A. Schmidt has been appointed manager of the New Products Division Hercules Steel Products Co., Galion, O. He has served as Equipment Engineer for the Pennsylvania Department of Highways and has been associated with various equipment manufacturers. The new Products Division, which he heads, will develop, improve and standardize new products already in production, including the Hercules Power Chute, a new unit for handling bulk materials, as well as other new products to be offered to the trade in the near future.

G. A. Schmidt

CF&I Pacific Coast Sales

The California Wire Cloth Corporation, West Coast subsidiary of the Colorado Fuel and Iron Corporation will manage sales and service operations of CF&I on the Pacific Coast. It will direct the sales of all products of the following companies: The Colorado Fuel and Iron Corporation, Wickwire Spencer Steel Division, Wickwire Spencer Metallurgical Corporation, Coburn Trolley Track Division, and American Wire Fabrics Corporation. Territories served by the new sales set-up will comprise the states of Washington, Oregon, California and Nevada.

Walb New President

Walter W. Walb has been elected president of the American Steel Dredge Co., Fort Wayne, Ind., to succeed his father, Clyde A. Walb, who died Oct. 30. Mr. Walb will continue to serve as general manager in addition to his new duties. He was also formerly vice-president and secretary-treasurer of the company. Maj. Dean F. Cutshall, who has been a vice-president ,remains in that office but now is also secretary-treasurer. Otto C. Scheimann is assistant treasurer.

International Harvester Pacific Coast Plant

International Harvester Co. has announced the establishment of its first Pacific Coast motor truck manufacturing plant at Emeryville, Calif. The Emeryville Works will produce six models of heavy-duty International trucks, especially designed for the highway and off-the-highway needs of truck operators in the eleven western states.

New Blaw-Knox Distributor

The Northwestern Sheet and Iron Works, of Wahpeton, N. Dak., has been appointed by the Blaw-Knox Co., Pittsburgh, to represent it in the entire state of North Dakota in the sale of construction equipment and various types of clamshell buckets.

Keystone Adds New Engineer

William (Bill) Kearn, has joined the sales staff of Keystone Asphalt Products Co., it was announced by Sales Manager T. R. Johnson. Mr. Kearn is well known in the construction field as an engineer experienced in airport and highway construction. After being honorably discharged from the Canadian Army, he held a position as a civilian technician for the war department, working as a construction engineer on the Alcan Highway. Mr. Kearn will represent the company as a sales engineer and will make their Chicago office his headquarters.

W. Kearn

Galion Opens New Export Office

For the past 15 years the Export Division of The Galion Iron Works & Manufacturing Co. has been located in Columbus, O. After January 15, 1946, all export activities will be directed from Galion, O., by the Export Sales Division which will be located in the general office building at the factory. Howard L. Glenn is export sales manager.

Appointed Ariens Sales Manager

Clark I. Wilson has been appointed general sales manager Ariens Co. Brillion, Wis. He has spent most of his business life in the field of sales and sales management, and was formerly associated with General Motors Corporation in administrative and executive capacities for 15 years.

G. W. Monfort Director News Bureau of Caterpillar

Appointment of Gordon W. Monfort to the advertising department of Caterpillar Tractor Co., Peoria, Ill., as director of the news bureau, has been announced by G. M. Walker, advertising manager. Mr. Monfort assumed his new duties Oct. 10 upon his arrival from California, where, since early in World War II, he had served as personnel director at "Caterpillar's" San Leandro plant. Mr. Monfort entered the "Caterpillar" organization as a member of the advertising department in 1928 but when the company offices were moved to Peoria in 1930 he remained in California to engage in business for himself as advertising counsel. In the following years he performed several special assignments for "Caterpillar" and in 1937 rejoined the company as western division advertising representative, a position he held until 1941 when he became personnel director.

G. W. Monfort

3 New Field Offices for Donaldson

The Donaldson Co., St. Paul, Minn., has opened three new field offices: Cleveland, O., at 2114 Lamberton Road, in charge of G. C. Bohn; Chicago, Ill., 600 S. Michigan Ave., C. D. Walter in charge; Detroit, Mich., at 6432 Cass Ave., F. H. Funke in charge.

New Name for Caine Piling

Because the name corrugated steel sheet piling has caused some misunderstanding of its structural characteristics, the Caine Steel Co., 1820 N. Central Ave., Chicago, Ill., has renamed the product Caine corr-plate steel piling.

New Buffalo-Springfield Distributors

The Hoye & Williams Co., 2121 Texas Ave., Shreveport, La., are new distributors for The Buffalo-Springfield Roller Co., Springfield, O. The territory covered will include the northern part of Louisiana and eight counties in eastern Texas.

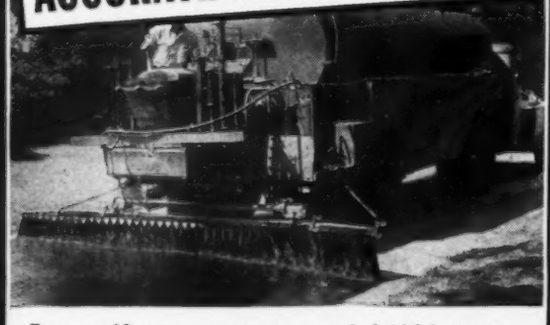
Le Roi Personnel Changes

John M. Dolan, heretofore general sales manager, Le Roi Co., Milwaukee, Wis., has been appointed vice president in charge of sales. For 5 years prior to joining Le Roi in October, 1943, he was manager of the compressor division of Sullivan Machinery Co. Since his association with Le Roi he has been active in establishing overall merchandising programs, covering all phases of the production line in both domestic and foreign fields. Cecil W. Brown, heretofore assistant sales manager, succeeds Mr. Dolan as general sales manager. He has been with Le Roi since 1938. Arthur A. Ladwig, with Le Roi since 1923, has been appointed vice president in charge of manufacturing.

John M. Dolan (left) and Cecil W. Brown

ETNYRE
"Black-Topper"
BITUMINOUS DISTRIBUTORS

ACCURATE and DEPENDABLE



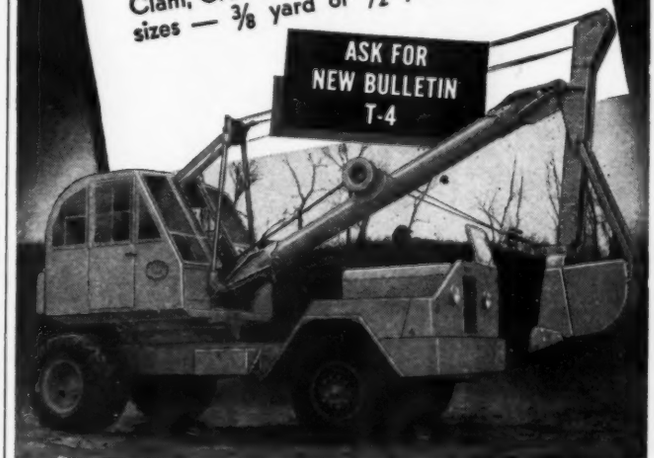
For over 40 years—constant research, faithful attention to engineering detail, quality construction methods and materials—all assure you of efficient, economical operation with Etnyre "Black-Topper", dependable and accurate always! Get latest specifications from your nearby Etnyre dealer or write, wire, or phone us today for full details on prices, models and deliveries.

E. D. ETNYRE & CO., Oregon, Illinois

A TRENCH HOE ON WHEELS...

With a digging depth of eleven feet, the Michigan combines real trench hoe advantages with convertibility to Shovel, Clam, Crane, and Dragline. Made in two sizes — 3/8 yard or 1/2 yard capacity.

ASK FOR NEW BULLETIN T-4



MICHIGAN
POWER SHOVEL CO.
BENTON HARBOR, MICHIGAN

CLEARING HOUSE

TIRE REPAIRS

All sizes truck, tractor up to and including 2400x 32-36 ply tires. Our Equa-Flex repair is built for heavy and rough work.

Farm tractor and passenger tires are guaranteed for the life of the tread.

WALLACE TIRE SERVICE, Inc.
2329 S. Michigan Ave. Chicago 16, Ill.

WANTED—ASPHALT PLANTS

1 or 2 Ton Cap. Main Plant
1 Portable Road Plant

E. J. BOYCE
Pierce Bldg. St. Louis, Mo.
or
THE DARIEN CORPORATION
Darien Conn.

POSITION WANTED

Sales Representative for Asphalts and Road Oils in the State of Wisconsin. Have had several years experience in the bituminous roads construction business. Box 100, Roads & Streets, 330 S. Wells St., Chicago 6, Ill.

ASPHALT PLANTS

5—½, 1 & 1½ Ton Portable & Stationary.

GAS ROAD ROLLERS

8 Ton Tandem—10 Ton 3 Wheel.

NEW GENERATING PLANTS

37—1½, 5, 10, 15 & 25 KW Kohler, Hill & Caterpillar Gas & Diesel.

ASPHALT TANKS

2—16,000 Gal. 10 lines heater coils, at Newark, Ohio.
16—10,000 Gal. Car Tanks at Chicago—New Orleans—Phila.—Houston.

L. M. STANHOPE
ROSEMONT PENNA.

FOR SALE

1—Northwest Crane, 45-ft. boom	$5000.00
1—Foot Paver	3000.00
1—Huber Roller, Gas, 10-ton (three wheel)	1250.00
3—Steam Tandem Rollers....(Prices Vary)	
1—Barber Asphalt Plant, 2000-lb. box	15,000.00
1—Acm Stone Crusher, screens and elevator, equipped with McCormick-Deering power unit	100.00
2—Euclid, 10 cu. yds., Side Dump Crawler Wagons, each	500.00
1—Barber-Greene Ditcher	2500.00
2—Drott Universal Bull Clam Shovels, each	750.00
1—Buckeye Sub Grader, 10' to 12'.	3250.00

Phil H. McGuire
P. O. Box 34 35th Street Station
Norfolk 8, Va.

USED SNOW REMOVAL EQUIPMENT FOR SALE

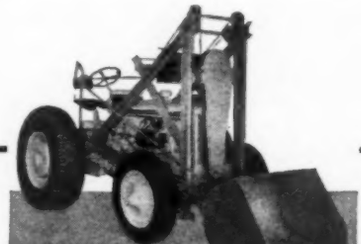
One Allis Chalmers K tractor with cab, full hydraulic Wausau plow.
Two caterpillar RD-6 tractors, cab, full hydraulic plows.
One caterpillar D-8 Wisconsin Special Tractor plow.
One caterpillar D-8 Wausau Tractor plow.
Two winter cabs for caterpillar D-8 tractors.

COLUMBIA COUNTY HIGHWAY COMMISSION
Portage, Wisc.

Latin American Service Engineer Available

Responsible U. S. graduate Civil Engineer, Colombian, 35, single, speaking Spanish and English fluently, with highway construction experience, wishes to act as Service Engineer to work with Latin American local engineers and highway officials and assist buyers in setting up, adjusting and operating of equipment. Willing to undertake factory training, field servicing, foreign sales policy, etc. Personal and business references on request. Box 10, Roads & Streets, 330 So. Wells Street, Chicago 6, Ill.

IN CLEVELAND
IT'S THE
HOLLENDEN
HOME OF THE FAMOUS
VOGUE ROOM
1000 ROOMS WITH BATH
• RADIO IN EVERY ROOM
FIVE FINE RESTAURANTS
CENTRAL DOWNTOWN LOCATION



½ *Cu. Yd.* — *8' Lift*

FRONT END LOADERS
for Industrial Tractors
Write for Catalog
Elkhart **White Mfg. Co.** Indiana

Buy More Victory Bonds

PORTABLE
ASPHALT PLANTS
High Production—Low Cost

THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

RELIANCE
CRUSHING, SCREENING
and WASHING UNITS
● Up to 2000 Tons a Day ●

Crushers	Bins	Drag-Lines
Elevators	Pulverizers	"GAYCO"
Sweepers	Feeders	Centrifugal
Screens	Spreaders	Air Separators
Wash Boxes	Kettles	
	Conveyors	

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.
Canadian Representatives: F. H. Hopkins & Co., Ltd.
340 Canada Cement Co., Montreal, Que., Can.

THAW CULVERTS and HYDRANTS
with an AEROIL

No. 98 Portable Steam Thawer
A handy steam plant with a detachable thawing torch. Used by leading Highway Departments for Culvert Thawing. Special Culvert Nozzle (10 ft.) available. Send for WINTER CATALOG No. 234-S including Concrete Heaters, Portable Coil Water Heaters, Thawing Torches, Ground Thawers, Salamanders, Tar and Asphalt Heaters, etc.
AEROIL PRODUCTS CO., INC.
5717 PARK AVE. WEST NEW YORK, N. J.
Branches: Chicago, San Francisco, Dallas

South Bend
GUTTER-SNIPE
PICK-UP STREET SWEEPERS
•
STREET FLUSHERS
STREET SPRINKLERS
BITUMINOUS DISTRIBUTORS
BITUMINOUS MAINTENANCE UNITS
•
Since 1908
MUNICIPAL SUPPLY COMPANY - SOUTH BEND 23, INDIANA

New Atlas Department Head

Weston G. Frome, since 1943 assistant general manager of Explosives Department of Atlas Powder Co., Wilmington, Dela., has been appointed general manager, succeeding F. S. Pollock, vice president, who has been elected a member of the executive. Mr. Frome came with Atlas in 1913.

Davey Compressor

The following new distributors have been appointed by the Davey Compressor Co., Kent, O.: Allied Equipment Corp., Albany, N. Y.; Myhra Equipment Co., Fargo, N. Dak.; North Jersey Equipment Co., 343 Elizabeth Ave., Newark, N. J.

Booklets and Pamphlets Received

Modern Developments in Reinforced Concrete ("R-C" No. 14), published by Portland Cement Association, 33 W. Grand Ave., Chicago, this issue is devoted to self-centering reinforcement for concrete structures, designed to save forming.

Third interim report (1945) N. Y. State Postwar Public Works Planning Commission, Albany.

Leading the Way in Safety; Traffic Safety in Portland Today. A 16-page illustrated pamphlet outlining Portland, Oregon's safety program and record of accident reduction. Published by Portland Traffic Safety Commission, Ben F. Heinz, director.

Circular, highway series No. 18, 18th Annual Conference of University of Colorado, published by the University, Boulder. Inquiries for copies should be directed to Roderick L. Downing, Professor of Civil Engineering.

"Small Airports." This 30-page reference was prepared to help nontechnical official and civic leaders interested in airports to gain a general knowledge of fundamentals and to more intelligently consider specific problems. Covers planning, design, construction, operations, finance, maintenance. Prepared by the Civil Aeronautics Administration; available from the U. S. Superintendent of Documents, Washington, D. C., price 10 cents.

FREE
THIS HELPFUL BOOK for CONSTRUCTION MAINTENANCE AND REPAIR
ON OIL BURNING
• Tar & Asphalt Kettles
• Bitumen Spray Kettles
• Lead Melting Furnaces
• Compound Melt. Furnaces
• Asphalt Surface Heaters
• Concrete Heaters
• Water Heaters
• Steam Generators
• Salamanders
• Torch Burner Equipments
• Portable Rivet Forges

Every contractor, superintendent and engineer—in road, highway, bridge or building construction or maintenance, can use profitably this catalog on Hauck Heating, Melting and Thawing Equipment to save time, labor and trouble. Write at once.

HAUCK MANUFACTURING CO.
119-129 Tenth St. • Brooklyn 15, N. Y.

LA CROSSE
HEAVY DUTY
MACHINERY TRAILERS
BUILT BY
LA CROSSE TRAILER & EQUIPMENT CO
LA CROSSE, WISCONSIN

VULCAN PAVEMENT AND CLAY DIGGING TOOLS
ARE MADE in a complete line of sizes to fit all standard compressed air hammers.
Send for NEW Vulcan illustrated CATALOG today.
VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY"
VULCAN TOOL MFG. CO.
QUINCY, MASS.

CONTRACTORS
RUBBER PRODUCTS

available from Stock
for immediate Delivery

CONVEYOR, ELEVATOR and
TRANSMISSION BELTING
all widths and plies

V-BELTS all sizes

HOSE
all sizes and types

AIR DISCHARGE STEAM
FUEL COMPRESSOR VACUUM
FIRE PILE DRIVERS SUCTION
WATER ROAD BUILDERS WELDING

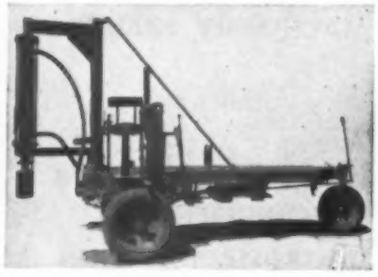
BOOTS, DREDGE SLEEVES,
PUMP DIAPHRAGMS, ETC.

. . . and everything rubber
for Industrial Requirements

Write for new catalog
PHONE . . . . . WRITE . . . . . WIRE

CARLYLE RUBBER CO., Inc.
62-66 PARK PLACE NEW YORK 7, N. Y.
Phone BArclay 7-9795

RAPID!



Cuts concrete and cuts labor costs to 2½c per square yard. Applicable to floor work and different types of inside horizontal work.

Very efficient in maintenance work of highways.

Boom folds down and readily trailed by any light truck. Make your compressor treble its output by hooking it to this machine.

Rapid Pavement Breaker Co.
1517 Santa Fe Ave.
Los Angeles 21, Calif.

INDEX TO ADVERTISERS

*Adams Mfg. Co., J. D.....Second Cover
*Aeroil Products Co. 133
*Allis-Chalmers Tractor Division..... 19
American Cable Division....Third Cover
American Chain & Cable....Third Cover
*Anthony Co. 30
Armco Drainage & Metal Products, Inc. 20
*Ariens Co. 126
Associated Equipment Distributors. 99
Auto Gear & Parts Co..... 4

*Barber Greene Co. 62
Baker Mfg. Co. 8-9
Barrett Div. (Allied Chem. & Dye Corp.) 93
*Bethlehem Steel Co. 1
Blackhawk Mfg. Co. 43
*Blaw-Knox Co. 15
Brooks Equipment & Mfg. Co..... 126
Buckeye Tractor Ditcher Co..... 52
Bucyrus-Erie Co. 50

C. I. T. Corp. 49
Calcium Chloride Assn. 95
Carbon Dispersions, Inc. 124
Carlyle Rubber Co., Inc..... 134
Caterpillar Tractor Co. 41
*Ceco Steel Products Corp. 32
*Cleaver-Brooks Co. 36
Cleveland Rock Drill Div. (Cleveland Pneumatic Tool Co.) 29
Colorado Fuel & Iron Corp. 33-34

Davey Compressor Co..... 129
Dodge Div. Chrysler Corp..... 42

*Electric Tamper & Equip. Co..... 121
*Erie Steel Constr. Co..... 38
Etnyre & Co., E. D. 131
Euclid Road Machy. Co..... 48

Fawick Airflex Co., Inc..... 51
Firestone Tire & Rubber Co..... 27
Foote Co., Inc., The..... 60
Ford Motor Trucks 40
*Four Wheel Drive Auto Co..... 17

*Galion Iron Works & Mfg. Co., The. 21
*Gar Wood Industries, Inc..... 25-53
Gemmer Mfg. Co. 31
*Grace Mfg. Co., W. E..... 28
Gulf Oil Corp. 91

*Hanson Clutch & Machinery Co..... 39
*Hauck Mfg. Co. 133
*Heil Co. 55
*Heltzel Steel Form & Iron Co..... 102
Hercules Steel Products Co. 46
Hetherington & Berner, Inc..... 23
Hollenden Hotel 132
Huber Mfg. Co., The..... 47

*International Harvester Co. 13-44
International Salt Co. 65

*Jahn Co., C. R..... 118
Jackson Vibrators, Inc. 121
*Jaeger Mach. Co., The..... 37

*Keystone Asphalt Co. 14
Klauer Mfg. Co..... 89
Koehring Co. 54
Kotal Co. 123

*La Crosse Trailer & Equipment Co.. 133
Le Tourneau, Inc., R. G..... 6-7
Lewis Equip. Co., H. W..... 130
Lincoln Steel Wks. 124
*Link-Belt Speeder Corp. 56
*Littleford Bros. 26

Mack Trucks, Inc. 64
Marion Steam Shovel Co., The..... 58
*Marmon-Herrington Co., Inc..... 59
McCarter Iron Works, Inc..... 133
Meili Blumberg Corp. 128
*Michigan Power Shovel Co..... 131
Municipal Supply Co. 133

National Production Co. 119
Northwest Engineering Co. 5
Nunn Mfg. Co. 129

*Oliver Corp. (Cletrac Div.) 35
Ottawa Steel Products, Inc..... 127
Owatonna Tool Co. 114
*Owen Bucket Co., The..... 125

Paving Brick Institute 119
Perfection Steel Body Co..... 2
Portland Cement Assn. 24
Powers' Road & Street Catalog..... 115

Rapid Pavement Breaker Co..... 134
Rogers Brothers Corporation..... 125
Rosco Mfg. Co. 113

*Sauerman Bros., Inc. 127
*Servicised Products Corp. 120
*Shunk Mfg. Co. 128
Sinclair Refining Co. 12
Standard Oil Calif. 63

*Texas Co., The.....66, Back Cover
Thew Shovel Co., The..... 3
Timken Roller Bearing Co...Front Cover
Truscon Steel Co. 16

Unit Crane & Shovel Corp..... 45
U. S. Steel 18
Union Wire Rope Corp..... 10-11
Universal Atlas Cement Co..... 18
Universal Road Machinery Co..... 133

Vickers, Inc. 57
Vulcan Tool Mfg. Co..... 133

Wallace Tire Service, Inc..... 132
Walter Motor Truck Co..... 61
Warren-Knight Co. 113
*Wellman Engineering Co., The..... 122
White Mfg. Co. 132
Wiley & Sons, Inc., John..... 128
*Worthington Pump & Machy. Corp. 22, 100-101

*Advertisers with * are represented in the 1945 edition of Powers Road and Street Catalog and Data Book. Please refer to it for additional information on any of their products.

ACCO-LOC SAFETY SPLICE

A SAFER, MORE RELIABLE METHOD FOR MAKING WIRE ROPE ENDINGS

The revolutionary ACCO-LOC Safety Splice makes hand-tuck splicing obsolete and unnecessary. Neat, compact, flexible to the terminal, it always develops 100% rope strength. It can be used with any standard fitting. Send today for literature.

ACCO-LOC Safety Splice offers many advantages, any one of which might easily justify its use.

1. It is safe. No wire ends to barb. It is easy to handle.
2. Does not distort the rope structure. Maintains equalized stresses in all strands.
3. It is neat, compact. Has no seizings to loosen and get in the way. Applies load stress in direct line with the pull of the load.
4. **ACCO-LOC Safety Splice** is extremely flexible—clear to the terminal, thus permitting close snubbing.
5. Easy to inspect at all times.
6. It may be used with any standard fitting (hook, ring, shackle, thimble, etc.). Upon retirement, fittings may be salvaged and re-used.
7. **ACCO-LOC Safety Splice** is made of preformed wire rope—the safe, kink-resisting, easy-to-handle type of wire rope.

Write or wire your nearest American Cable Division office.

ARMY (E) NAVY

ACCO

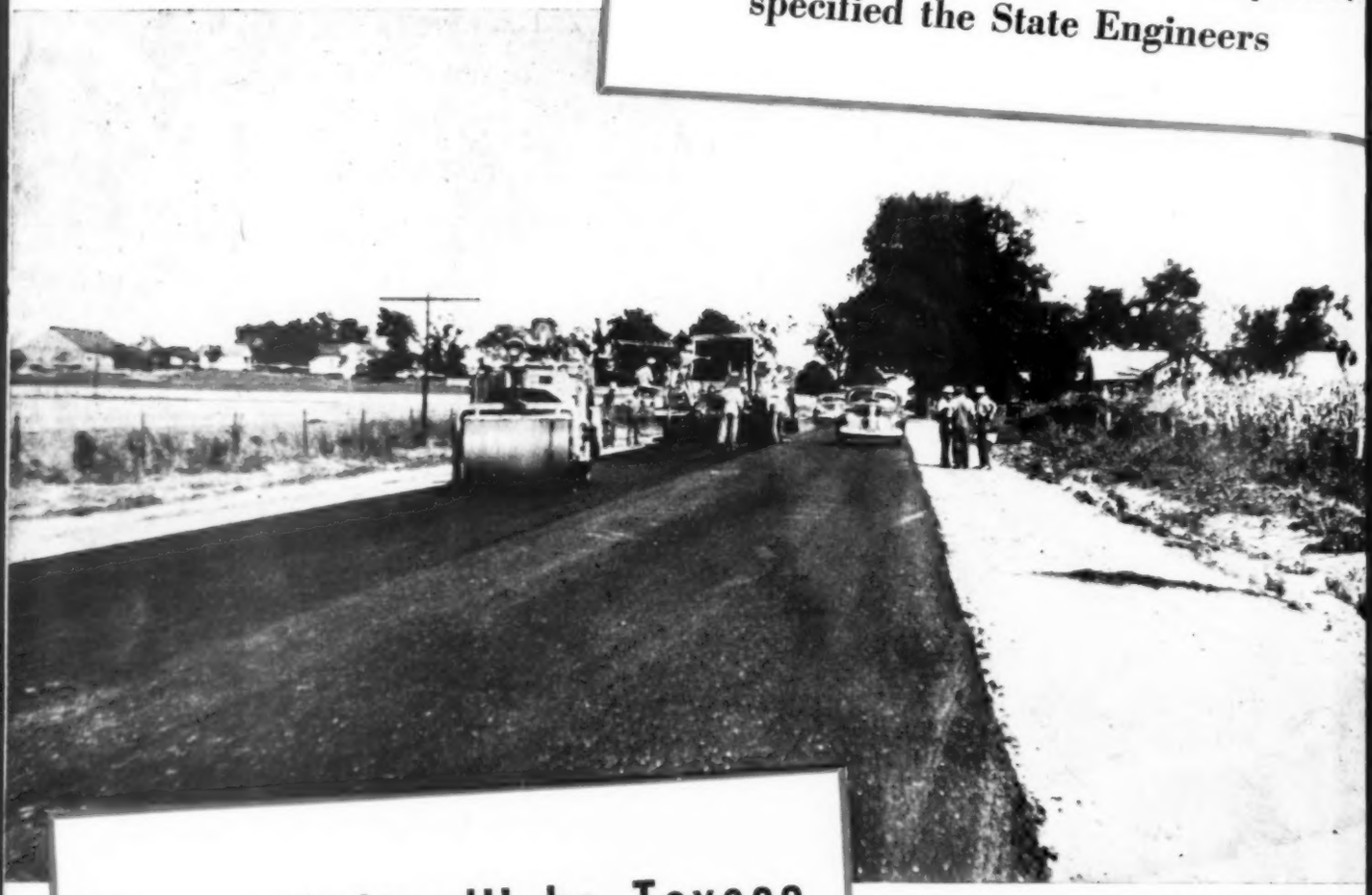
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Bridgeport, Conn.

ACCO TRADE MARK

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

In Business for Your Safety

The pavement will be Asphalt
specified the State Engineers



The asphalt will be Texaco
decided the Contractor

Constructing three inches of dense-graded Texaco Asphaltic Concrete paving on State Highway No. 145 in Massac and Johnson Counties, Ill. The Charles G. Gilmore Asphalt Products Company of Anna, Ill., was the contractor.

That combination of decisions resulted in the construction of a 3-inch plant-mixed Texaco Asphalt pavement on this State Highway in southern Illinois.

The same combination of decisions has been made on one highway project after another these past 40 years, with the result that thousands of miles of America's highways have been Texaco-paved.

Texaco Asphaltic products are indeed "old stand-bys" of U. S. road builders. They have played an important part in the good roads movement in this country since the horse and buggy days. Texaco Asphalt Cements, Cutback Asphalts and Emulsified Asphalts will play an equally useful role in the big post-war highway program ahead.

Texaco Engineers, who are Asphalt specialists, are always at your service. If you would like to discuss a highway construction or maintenance problem with them, write our nearest office.

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd Street, New York City 17

Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Philadelphia 2 Richmond 19

TEXACO

REG. T. M.

TEXACO ASPH